



LIGHTLAB 3 LIGHTLAB 3 HS USER'S GUIDE

LIGHTLAB³™ CANNABIS AND PSYCHEDELICS ANALYZER
BY ORANGE PHOTONICS

Version 1.5.00

INTRODUCTION

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INTRODUCTION

Welcome

Welcome and thank you for choosing Orange Photonics.

LightLab 3 cannabis potency analyzer comes to you fully calibrated and ready to use. We are proud to serve established cannabis and hemp industry leaders and newcomers in support of greater efficiency and higher quality products through data.

On behalf of the entire Orange Photonics team, we look forward to working with you.

Sincerely,

The Orange Photonics Team

INTRODUCTION

LightLab Introduction

LIGHTLAB MODEL COMPARISONS

There are 4 different models of LightLabs available. Refer to your packing list to determine which LightLab you are using. An overview of the models and their differences can be found below. See Appendix 3 for full performance details for each model.

| Feature | LightLab 3 Canna | LightLab 3 Psy | LightLab 3 Psy+Canna | LightLab 3 HS |
|----------------------------------|-----------------------------------|---|---|---|
| Best for | Growers and Processors/Extractors | Mushroom Manufacturers | Mushroom and Cannabis Manufacturers | Edibles Manufacturers+Growers and Processors/Extractors |
| Measures Flowers+Concentrates | yes | no | yes | yes |
| Measures Cannabis Edibles | no | no | yes | yes |
| Measures Mushroom Products | no | yes | yes | no |
| Cannabinoids Measured | 19+semi-quantitative terpenes | n/a | 19+semi-quantitative terpenes | 19+semi-quantitative terpenes |
| Mushroom Analytes Measured | n/a | Psilocybin, Psilocin, 4-ACO-DMT (more coming) | Psilocybin, Psilocin, 4-ACO-DMT (more coming) | n/a |
| Cannabis SOPs/Sample Types | 12 | n/a | 29 | 29 |
| Mushroom SOPs/Sample Types | n/a | 11 | 11 | n/a |
| Flower Detection Limit | 0.50% | n/a | 0.50% | 0.50% |
| 20% Flower Repeatability | ±0.7% | n/a | ±0.7% | ±0.7% |
| Concentrate Detection Limit | 1.50% | n/a | 1.50% | 1.50% |
| 80% Concentrate Repeatability | ±2.1% | n/a | ±2.1% | ±2.1% |
| Gummy Detection Limit | n/a | n/a | 0.7mg | 0.2mg |
| 10mg Gummy Repeatability | n/a | n/a | ±0.7mg | ±0.3mg |
| Beverage Detection Limit | n/a | n/a | 5ppm | 1.7ppm |
| 10mg Beverage Repeatability | n/a | n/a | ±1.0mg | ±0.7mg |
| Mushroom Biomass Detection Limit | n/a | 0.08% | 0.08% | n/a |
| Mushroom Biomass Repeatability | n/a | ±0.07% | ±0.07% | n/a |

LIGHTLAB PACKING LIST

The first time you use LightLab unpack the components on a clean, flat surface and familiarize yourself with each item.

Packing list LightLab3 Canna:

| Standard Equipment | Units |
|---|-------|
| LightLab 3 Analyzer | 1 |
| Extraction Shaker and Connecting Cable | 1 |
| Fluidics Hardware | 1 |
| Flushing Hardware | 1 |
| Electric Sample Grinder (Located in complimentary flower kit) | 1 |
| USB Drive with Manual and supporting files | 1 |
| Power Supply | 1 |
| Sample Input Cover | 1 |
| Scale | 1 |
| Shaker Straps | 2 |
| Tweezers | 1 |
| Solvent A and B caps | 1 |
| Optional Equipment | |
| Sample Warmer | |
| Workbench Fluidics | |

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Packing list LightLab3 HS, LightLab3 Psy and LightLab 3 Psy+Canna:

| Items | Units |
|---|--------------|
| LightLab 3 HS Analyzer | 1 |
| Extraction Shaker and Connecting Cable | 1 |
| Fluidics Hardware | 1 |
| Flushing Hardware | 1 |
| Electric Sample Grinder (Located in complimentary flower kit) | 1 |
| Sample Warmer | 1 |
| Scissors | 1 |
| USB Drive with Manual and supporting files | 1 |
| Power Supply | 1 |
| Scale | 1 |
| Shaker Straps | 2 |
| Tweezers | 1 |
| Solvent A and B caps | 1 |
| Optional Equipment | |
| Workbench Fluidics | |

WHAT SAMPLE TYPES CAN LIGHTLAB MEASURE?

LightLab 3 Canna Sample Types

- Plant
- Concentrate
- Young Plant
- Raffinate
- Tincture
- Isolate
- Converted Cannabinoid Concentrates (with converted cannabinoid module)
- Hemp Compliance (with hemp compliance module)
- Custom Modes

LightLab3 HS Sample Types:

- Plant
- Concentrate
- Young Plant
- Raffinate
- Tincture
- Isolate

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- Converted Cannabinoid Concentrates (with converted cannabinoid module)
- Hemp Compliance (with hemp compliance module)
- Custom Modes
- Gummy
- Beverage
- Beverage Enhancer by Weight
- Beverage Enhancer by Volume
- Dry Beverage Enhancer
- Chocolate
- Baked Goods
- Hard Candy
- Mint/Tablet
- Caramel/Taffy
- Liquid Nanoemulsion by weight
- Liquid Nanoemulsion by volume
- Dry Nanoemulsion
- Converted Cannabinoid Gummy
- Other Edible

LightLab 3 Psy Sample Types:

- Mushroom Biomass
- Mushroom Gummy
- Mushroom Chocolate
- Mushroom Capsules
- Wet Mushroom Biomass
- Mushroom Extract 0-15%
- Mushroom Extract 15-100%
- Custom Mushroom low range
- Custom Mushroom high range

LightLab 3 Psy+Canna Sample Types:

- Mushroom Biomass
- Mushroom Gummy
- Mushroom Chocolate
- Mushroom Capsules
- Wet Mushroom Biomass
- Mushroom Extract 0-15%
- Mushroom Extract 15-100%

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- Custom Mushroom low range
- Custom Mushroom high range
- Plant
- Concentrate
- Young Plant
- Raffinate
- Tincture
- Isolate
- Converted Cannabinoid Concentrates (with converted cannabinoid module)
- Hemp Compliance (with hemp compliance module)
- Custom Modes
- Gummy
- Beverage
- Beverage Enhancer by Weight
- Beverage Enhancer by Volume
- Dry Beverage Enhancer
- Chocolate
- Baked Goods
- Hard Candy
- Mint/Tablet
- Caramel/Taffy
- Liquid Nanoemulsion by weight
- Liquid Nanoemulsion by volume
- Dry Nanoemulsion
- Converted Cannabinoid Gummy
- Other Edible

For LightLab HS and LightLab Psy+Canna, each edible mode may be used for several product types. Example product types are listed below for each mode:

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| Edible Mode | Can Be Used For |
|-------------------------------|---|
| Beverages | sodas, seltzers, juices, tea, coffee, carbonated beverages |
| Gummies | Gelatin, Pectin and Tapioca based gummies both in finished state and liquids prior to molding |
| Beverage Enhancer Liquids | High concentration beverage shots, liquid infusers for beverages |
| Beverage Enhancer Solids | drink mixes, infused sugars, enhancer tablets |
| Chocolates | Solid chocolates, soft center chocolates, truffles, white, dark and milk chocolates |
| Baked Goods | Cookies, brownies, cakes, tarts, rice crispy treats, pet treats |
| Hard Candies | Hard candy, lozenges, lollipops, hard sugar-based candies |
| Mints | Mints, infused tablets/pills |
| Caramels | Caramels, chocolate covered caramels, taffy, soft chewy candies |
| Liquid Nanoemulsions | nanoemulsions used for edibles dosing, manufacture control of nanoemulsion creation |
| Solid Nanoemulsions | powdered nanoemulsions, pressed nanoemulsion tablets |
| Converted Cannabinoid Edibles | Any edibles containing hemp-derived converted cannabinoids |
| Other Edibles | Custom edible types |

WHAT ANALYTES DOES LIGHTLAB MEASURE?

LightLab uses a combination of chromatography (chemical separation based on molecular polarity) and spectroscopy (light based chemical analysis) to provide accurate analysis of several components in complex mixtures. The basic process is usually called HPLC (High Performance Liquid Chromatography) and is used by most cannabis and hemp testing labs for cannabinoid analysis as well as most mycology potency testing labs.

LightLab is factory calibrated and will begin providing results directly out of the box for up to 19 cannabinoids+2 calculated total cannabinoids, semi-quantitative terpenes and 3 tryptamines+2 calculated total tryptamines depending on the model and options selected.

The following is a list of analytes LightLab can measure:

Cannabinoids Measured (LightLab 3 Canna, HS and Psy+Canna):

THC-A: Tetrahydrocannabinolic Acid. This is the “acidic” form of tetrahydrocannabinol (THC). Cannabis plants naturally produce THCA and is the primary cannabinoid that will be present in most cannabis strains. Typically, plants have 10-20% THCA. A higher THCA number means a more potent plant.

Δ 9THC: Delta 9 Tetrahydrocannabinol. This is the “active” or “neutral” form of THC. This is the primary psychoactive cannabinoid seen in cannabis plants. Plants do not directly produce Δ 9THC. Instead, THCA is converted into Δ 9THC through a process called decarboxylation. Decarboxylation occurs when the plant is smoked, otherwise heated, or exposed to light. Typically, plants have 0-5% Δ 9THC. High levels of Δ 9THC in plant material indicate the plant may not have been stored or cured well or may be old.

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Total Δ9THC: This number indicates the total quantity of Δ9THC if the sample was completely decarboxylated. Decarboxylation is the conversion of THCA to Δ9THC in the presence of heat or light. During the decarboxylation process, a CO₂ molecule is released, so a THCA molecule will weigh less once it is converted to Δ9THC. For that reason, the total “potency”, or how much psychoactive Δ9THC a user would be dosed with requires a conversion factor. The “total Δ9THC” factors in the loss of weight of THCA when converting to Δ9THC. The equation used is as follows:

$$\text{Total } \Delta 9\text{THC} = 0.877 \times \text{THCA} + \Delta 9\text{THC}$$

This number is an indication of the overall “potency” of the sample.

CBD-A: Cannabidiolic Acid. CBDA is the CBD analog to THCA. It is the acidic form of CBD that plants produce. Typical non-CBD specific strains will have 0-2% CBDA. CBD Specific plants typically contain 5-20% CBDA. CBDA is not psychoactive.

CBD: Cannabidiol. CBD is the neutral form of CBDA. Cannabis plants do not create CBD directly; however, this cannabinoid can be formed through the same decarboxylation process described above.

Total CBD: This number indicates the total quantity of CBD if the sample was completely decarboxylated. Decarboxylation is the conversion of CBDA to CBD in the presence of heat or light. During the decarboxylation process, a CO₂ molecule is released, so a CBDA molecule will weigh less once it is converted to CBD. For that reason, the total CBD potential, or how much CBD a product will contain once fully decarboxylated requires a conversion factor. The “total CBD” factors in the loss of weight of CBDA when converting to CBD. The equation used is as follows:

$$\text{Total CBD} = 0.877 \times \text{CBDA} + \text{CBD}$$

CBG-A: Cannabigerolic Acid. CBGA is a precursor molecule to THCA and CBDA. When a plant produces cannabinoids, it always produces CBGA first, then an enzymatic process converts CBGA to THCA and/or CBDA. CBGA can be used as an indicator of harvest readiness. If >1% CBGA is present in a sample, it typically means the plant can continue to produce active cannabinoids. A CBGA value of <1% is typically desirable. Plants commonly contain between 0-4% CBGA.

CBG: Cannabigerol. CBG is the neutral form of CBGA, akin to CBD vs CBDA. CBG is often found in concentrates at low levels since plants that are harvested earlier contain CBGA, which is then decarboxylated during the extraction process. Note CBG is a calculated value in LightLab since CBG and CBD have nearly identical chromatographic retention times.

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CBN: Cannabinol. CBN is a breakdown component of Δ^9 THC. It is mildly psychoactive and sedative. Fresh cannabis plants typically show no CBN. Very old plants may contain 0-5% CBN. CBN can also be generated during extraction or distillation, and commonly occurs at 0-5% levels in extracted samples. More CBN is typically undesirable and is an indication of too much heat or exposure to environmental factors.

Minors Module Additional Cannabinoids: The minors module provides additional cannabinoids in addition to the standard cannabinoids listed above. These include:

- **CBC-A:** Cannabichromenic Acid. CBC-A is the acidic form of CBC. It is non-psychoactive and is formed in some plant genetics alongside THC-A and CBD-A, typically at lower concentration. Its precursor is CBG-A. Some genetics will exhibit 1-5% CBC-A.
- **CBC:** Cannabichromene. CBC is the neutral form of CBC-A. CBC is often present in hemp and CBD containing plants, and more rarely in THC containing plants. Since many laboratories do not yet measure CBC, the Minors Module will allow hemp farmers, CBD growers and processors to select for higher CBC plants and differentiate their product with a new cannabinoid.
- **CBN-A:** Cannabinolic Acid. CBN-A is the acidic form of CBN. It is often formed from aged cannabis plants. Very old plants may contain 0-5% CBNA. CBN-A in combination with CBN are good indicators of the age and storage conditions of plant material. Higher CBNA and CBN typically indicate old plant material or poorly stored plant material.
- **Δ 10-THC:** Previously Degraded THC, Δ 6a,10aTHC. In some cases, distillation can breakdown the THC molecule into by-products, reducing the potency of the product and affecting the flavor profile. This is generally an indicator of a vacuum leak or too much heat being applied to the sample. Two of the major breakdown components are CBN and Δ 10-THC. LightLab can measure the amount of Δ 10-THC, allowing distillation operators to ensure their product is pure and potent while maintaining high throughput. Note Δ 10-THC may represent more than one cannabinoid that is similar in chemical makeup. These include Δ 10-THC, Δ 6a,10a THC (often referred to as Δ 10a THC), dihydroxy Δ 10-THC, dihydroxy Δ 6a,10a THC and similar analogs.
In some cases, extraction operators will intentionally attempt to generate novel cannabinoids through a degradation process. Δ 10-THC is a precursor to most of the degradation products generated.
- **Δ 8-THC:** Δ 8-THC is generally made by converting CBD or Δ 9-THC in a chemical reaction. Note that the process used to create Δ 8-THC often creates other cannabinoids, including Δ 9-THC. LightLab has a higher detection limit of 4% for flower samples and 12% for concentrates. See Appendix 2 for further

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- information on Δ^8 -THC. Note accuracy of Δ^8 -THC and Δ^9 THC are reduced in the presence of Δ^8 -THC, which is why there is an asterisk next to the cannabinoid.
- **THCV-A:** Δ^9 -Tetrahydrocannabivarinic acid is the acidic form of Δ^9 -Tetrahydrocannabivarin and is found naturally in some cannabis cultivars. Varin cannabinoids have a 3 carbon “tail” or hydrocarbon chain as opposed to the tetrahydrocannabinol’s 5 carbon tail. Varin species are valued as a less potent fully natural cannabinoid.
 - **THCV:** Δ^9 -Tetrahydrocannabivarin is the neutral form of THCV. Varin cannabinoids have a 3 carbon “tail” or hydrocarbon chain as opposed to the tetrahydrocannabinol’s 5 carbon tail.

Converted Cannabinoid Additional Cannabinoids: The converted cannabinoid module provides additional cannabinoids that don’t typically occur in natural cannabis at high concentrations. These are generally either derived from hemp or cannabis plant material through chemical reactions or are fully chemically synthesized. These are often sold in states where cannabis is not fully legal since the laws are not clear on whether converted cannabinoids are legal or not.

With the purchase of a converted cannabinoid module, separate analysis buttons will be present on LightLab to allow converted cannabinoid analysis. These include a concentrate-specific mode for simplified raw material analysis as well as custom modes for more advanced analysis including infused products, tinctures, etc.

Note that converted cannabinoid analysis is a separate mode in LightLab. Samples that do not contain converted cannabinoids should not be run in converted cannabinoid modes. The separate converted cannabinoid mode allows LightLab to zero in on converted cannabinoids specifically to provide the highest accuracy and precision.

LightLab uses a direct calibration using CRMs for calibration just like Laboratories do. This is not the case for the vast majority of portable/in-house cannabis devices, which rely on computer models generated from laboratory results. That means LightLab is capable of providing laboratory-grade results in a portable and economical package. In the case of converted cannabinoids, Certified Reference Materials (CRMs) are not available. Instead, LightLab relies on non-certified materials for calibration. These generally have higher uncertainty, and therefore the accuracy of LightLab will be lower for converted cannabinoids when compared to typical phytocannabinoids. Note that this is also the case for any laboratory testing converted cannabinoids as they rely on the same standards that LightLab does.

The converted cannabinoid module modes do not analyze the full list of cannabinoids LightLab can analyze. This allows LightLab to provide the highest accuracy on the

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cannabinoids that will generally be present in converted cannabinoid samples.

Converted Cannabinoid modes are capable of analyzing the following analytes:

- D8THCO
- D9THCO
- HHC
- D8THCP
- D9THCP
- D8THC
- D9THC
- D10THC
- CBN
- CBD
- CBDA
- CBGA
- CBC
- THCV
- Terpenes

A description of the additional cannabinoids available with the module can be found below:

- **Δ 8-THC-O-Acetate:** Δ 8-THC-O-Acetate is an “acetylated” form of Δ 8-THC. The acetylation process is thought to increase the potency of a given cannabinoid. Most research suggests that Δ 8-THC-O-Acetate is not found in nature. Most products labeled “THC-O” contain significant amounts of Δ 8-THC-O-Acetate
- **Δ 9-THC-O-Acetate:** Δ 9-THC-O-Acetate is an “acetylated” form of Δ 9-THC. The acetylation process is thought to increase the potency of a given cannabinoid. Since most samples labeled “THC-O” are hemp derived, Δ 9-THC-O-Acetate is generally found in approximately the same ratio as the ratio of Δ 9-THC to Δ 8-THC in the starting/feedstock material before acetylation.
- **HHC:** Hexahydrocannabinol is a hydrogenated derivative of tetrahydrocannabinol. HHC is “hydrogenated”, meaning extra hydrogen has been added to the molecule. Although it has been found naturally, most HHC is converted from Δ 8-THC, Δ 9-THC or CBN.
- **Δ 8-THCP-** Δ 8-Tetrahydrocannabiphorol has a 7-carbon chain “tail” or hydrocarbon chain as opposed to the tetrahydrocannabinol’s 5 carbon tail. Research suggests THCP cannabinoids are more potent than standard THC cannabinoids. Generally THCP species are fully synthesized rather than reacted from a different cannabinoid. This makes THCP more expensive to manufacture, and therefore a larger amount of mislabeled product can be found in the market.
- **Δ 9-THCP-** Δ 9-Tetrahydrocannabiphorol has a 7-carbon chain “tail” or hydrocarbon chain as opposed to the tetrahydrocannabinol’s 5 carbon tail. Δ 9-

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THCP and $\Delta 8$ -THCP differ in the same way that $\Delta 9$ -THC and $\Delta 8$ -THC differ- there is one double bond location that is changed between the two cannabinoids. Research suggests THCP cannabinoids are more potent than standard THC cannabinoids. Generally THCP species are fully synthesized rather than reacted from a different cannabinoid. This makes THCP more expensive to manufacture, and therefore a larger amount of mislabeled product can be found in the market.

Terpenes Module (semi quantitative): Terpenes are volatile compounds present in cannabis plants that are largely responsible for the scent of the cannabis. LightLab reports terpene content in samples as *low*, *medium*, or *high* terpene content. The terpenes module uses the terpene profile of a typical cannabis plant for calculating the final terpene content since not all terpenes can be measured. Since the calculation is not exact, the results are reported as semi-quantitative *low*, *medium*, or *high* terpene content. *Low* indicates a terpene content of <1%, *medium* indicates a terpene content between 1% and 2% and *high* terpene content indicates a terpene content >2%.

Hemp Compliance Module: LightLab may be purchased with an optional Hemp Compliance Module which allows detection of THCA and D9THC in hemp samples down to 0.05% with high precision. When using this mode, only THCA and D9THC values will be displayed. To determine other cannabinoids, a separate analysis must be made. Hemp analysis can be used on dried hemp material with a maximum THCA or D9THC level of 3%.

Note: Hemp Compliance module is only recommended for dried plant material. Any samples containing “sprayed” plant materials containing $\Delta 8$ -THC or Converted Cannabinoids are not compatible with the Hemp Compliance Module.

Mushroom Analytes Measured (LightLab 3 Psy and Psy+Canna models)

Psilocybin (PCB): Psilocybin is the primary tryptamine created by psilocybe cubensis and related species of psychedelic mushrooms. Generally, psilocybin is converted into psilocin in the body when ingested through a dephosphorylation process. Typically, mushroom biomass contains mostly psilocybin.

Psilocin (PCN): Psilocin is created when psilocybin is dephosphorylated. It is an active psychedelic and the primary driver of the psychedelic properties of mushrooms. Psilocin is found in smaller amounts than psilocybin in mushroom biomass, typically on the order of 0-10% of the psilocybin content. Psilocin is an inherently unstable molecule and can be damaged by light, heat, pH and other environmental factors.

4-AcO-DMT (Psilacetin, 4-AcO): 4-AcO-DMT is often referred to as “Synthetic Psilocybin”. This laboratory made tryptamine is similar to psilocybin but contains an acetate group in the place of a phosphate group. 4-AcO-DMT is thought to convert to

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psilocin when ingested. It is often added to infused edibles due to its lower cost and higher stability compared to natural mushroom products.

DETECTION LIMITS AND REPEATABILITY

The detection limit of LightLab will vary depending on the options selected including the sample weight, solvent volume and moisture correction values entered as well as the LightLab model being used for analysis. LightLab Certificates of analysis will list detection limits for all analytes for a particular sample.

For a full list of detection limits, repeatability and reproducibility, refer to Appendix 3.

In general terms:

- An increase in sample weight will provide a lower detection limit.
- An increase in solvent volume will provide a higher detection limit.
- An increase in moisture content will provide a higher detection limit.

LightLab 3 Canna, HS and Psy+Canna Standard Cannabis Product Detection Limits

The detection limits are the same for all cannabinoids except $\Delta 8$ -THC and converted cannabinoids. If a cannabinoid is not detected, LightLab will report “ND”, which means Not Detected. The typical detection limit for each mode is listed below:

THC Dominant Plant: 0.5% (4% $\Delta 8$ -THC)

CBD Dominant Plant: 0.75% (6% $\Delta 8$ -THC)

Unknown Plant: 0.5% (4% $\Delta 8$ -THC)

THC Dominant Concentrate: 1.5% (12% $\Delta 8$ -THC, 3% Converted Cannabinoids)

CBD Dominant Concentrate: 2% (16% $\Delta 8$ -THC)

Unknown Concentrate: 1.5% (12% $\Delta 8$ -THC)

Hemp Compliance: 0.05%

Young Plant: 0.2%

Raffinate: 0.25%

Trim: 1%

Isolate: 3%

Infused Product: Varies, see below.

Custom: Varies, see below

The detection limit for LightLab 3 is based on the following equation:

$$\text{detection limit}(\%) = \frac{\left(\frac{\text{ml solvent added}}{\text{g sample weight}}\right)}{(1 - (\% \text{ moisture content entered})/100)} * .005$$

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For example, 0.110 g sample, 30ml solvent, 20% moisture:

$$\frac{\left(\frac{30 \text{ ml solvent added}}{0.110 \text{ g sample weight}}\right)}{(1 - (20\% \text{ moisture content entered})/100)} * .005 = 1.7\% \text{ detection limit}$$

Note: Detection limits for converted cannabinoids and Delta-8 THC are different than other analytes and can be calculated as follows:

Δ8-THC:

$$\text{detection limit}(\%) = \frac{\left(\frac{\text{ml solvent added}}{\text{g sample weight}}\right)}{(1 - (\% \text{ moisture content entered}/100))} * .04$$

Δ8-THC-O-Acetate, Δ9-THC-O-Acetate, Δ9-THCP, Δ8-THCP, HHC

$$\text{detection limit}(\%) = \frac{\left(\frac{\text{ml solvent added}}{\text{g sample weight}}\right)}{(1 - (\% \text{ moisture content entered}/100))} * .01$$

LightLab 3 HS Edibles Detection Limits

LightLab 3 HS has the lowest detection limit of any LightLab since the analyzer has a 30x more sensitive detection system. The detection limits for HS depend on the sample type and size since different edibles require different sample preparations. LightLab HS will automatically determine an ideal sample preparation for your edible using a sophisticated algorithm that takes into account dosages, sample size and edible type. The table below shows detection limits for typical edibles for reference:

| Sample Type | Typical Dose, mg | Typical Sample Size, g or ml | Typical Detection Limit % |
|-------------------|------------------|------------------------------|---------------------------|
| Gummy | 5 | 3.5 | 0.0067% |
| Beverage | 10 | 355 | 0.00017% |
| Beverage Enhancer | 100 | 50 | 0.0050% |
| Chocolate | 10 | 10 | 0.0033% |
| Baked Goods | 10 | 25 | 0.0017% |
| Hard Candy | 5 | 10 | 0.0033% |
| Mint | 5 | 2 | 0.0067% |
| Taffy | 5 | 10 | 0.0033% |
| Caramel | 5 | 10 | 0.0033% |
| Nanoemulsion | 100 | 10 | 0.0333% |

LightLab 3 HS has two injection modes that are automatically selected based on the sample type and parameters chosen. For all standard LightLab modes and high

INTRODUCTION

concentration edibles (generally, edibles that are higher than 3% by weight), LightLab 3 HS has the same detection limit equation as the standard LightLab 3. For most edibles, Lightlab HS uses a high sensitivity injection mode that has the following equation, which is 30x lower than standard LightLab 3 detection limits:

$$\text{detection limit}(\%) = \frac{\left(\frac{\text{ml solvent added}}{\text{g sample weight}}\right)}{(1 - (\% \text{ moisture content entered})/100)} * .000167$$

LightLab Psy+Canna Edibles Detection Limits

LightLab Psy+Canna has a 10x lower detection limit than a standard LightLab for edibles analysis. While it can be used for edibles analysis much like LightLab HS, it has a 3x higher detection limit and has repeatability that is approximately 2x more variable than LightLab HS.

LightLab will automatically determine an ideal sample preparation for your edible using a sophisticated algorithm that takes into account dosages, sample size and edible type. The table below shows detection limits for typical edibles for reference:

| Sample Type | Typical Concentration, % | Detection Limit % |
|--------------------------|--------------------------|-------------------|
| Gummy | 0.29% | 0.020% |
| Beverage | 0.00% | 0.001% |
| Beverage Enhancer Liquid | 0.33% | 0.020% |
| Beverage Enhancer Powder | 0.40% | 0.020% |
| Chocolate | 0.10% | 0.010% |
| Baked Goods | 0.04% | 0.005% |
| Hard Candy | 0.05% | 0.010% |
| Mint/Tablet | 0.25% | 0.020% |
| Caramel/Taffy | 0.05% | 0.010% |
| Nanoemulsion Liquid | 2.50% | 0.200% |
| Nanoemulsion Solid | 2.50% | 0.200% |

LightLab 3 Psy+Canna has two injection modes that are automatically selected based on the sample type and parameters chosen. For all standard LightLab modes and high concentration edibles (generally, edibles that are higher than 3% by weight), LightLab 3 Psy+Canna has the same detection limit equation as the standard LightLab 3. For most edibles, Lightlab Psy+Canna uses a high sensitivity injection mode that has the following equation, which is a0x lower than standard LightLab 3 detection limits. Lightlab Psy+Canna detection limits can be calculated using the following equation:

$$\text{detection limit}(\%) = \frac{\left(\frac{\text{ml solvent added}}{\text{g sample weight}}\right)}{(1 - (\% \text{ moisture content entered})/100)} * .00033$$

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LightLab Psy and Psy+Canna Psychedelics Detection Limits

LightLab Psy and Psy+Canna have the same detection limits for psychedelics. The following table shows typical detection limits for typical samples. LightLab will automatically adjust sample preparation to provide the best detection limits possible for a particular sample.

| Sample Type | Typical Concentration, % | Detection Limit % |
|---------------------|--------------------------|-------------------|
| Biomass | 1% | 0.08% |
| Concentrate 0-15% | 5% | 0.8% |
| Concentrate 15-100% | 50% | 3.3% |
| Gummy | 0.14% | 0.0100% |
| Chocolate | 0.05% | 0.00500% |
| Capsule | 1.00% | 0.0750% |
| Wet Biomass | 0.40% | 0.0200% |

MOISTURE CORRECTION

LightLab typically reports results in weight percent as is commonly employed with any analytical test for cannabinoids. Typically, plant measurement is completed on cured, dried material. LightLab can also measure fresh plant material that contains significantly more water than typical cured plant. In fact, a typical fresh cannabis plant contains 70-80% moisture. LightLab can analyze wet plant material without issue, however the moisture content can make results difficult to interpret. Since LightLab reports in *weight* percent, and 70-80% of the weight is water, that means only 20-30% of the weight is plant material. For example, a 1g wet sample with 75% moisture would have 0.75g of water and 0.25g of plant material. That means LightLab will report much lower results for the wet material than the completely dried material of the same plant.

For this reason, LightLab has an option to turn on moisture correction for plant material. When enabled, LightLab will calculate results as dry weight percent. If a moisture content is entered during a test, LightLab will calculate the *dry* weight percent. In other words, it will calculate the results based on the plant material remaining after water is removed. This will result in a higher result than running without any correction. The equation used is as follows:

$$\text{Moisture Corrected Result (\%)} = \frac{\text{Weight Percent Result}}{(1 - (\% \text{ moisture content entered}/100))}$$

As an example, let's assume a plant has 75% moisture, and without moisture correction the result was 5% CBDA:

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$$\text{Moisture Corrected Result (\%)} = \frac{5\% \text{ CBDA}}{\left(1 - \left(\frac{75}{100}\right)\right)} = 20\% \text{ CBDA}$$

Note entering an incorrect moisture content can result in significant errors. We therefore recommend drying the same where possible to avoid these errors unless careful measurement of moisture is made possible. See Appendix 1 for drying recommendations.

As a general rule, cured cannabis has approximately 10% moisture content, and fresh cannabis contains 70-80% moisture. If semi-quantitative dry weight measurements are desired, using these values will allow for ballpark dry weight measurement. Keep in mind the result error and repeatability will be higher if the moisture changes between sample analyses.

LIGHTLAB CALIBRATION

LightLab arrives fully calibrated and ready to use. LightLab is calibrated at our factory, and we recommend occasional calibration to maintain LightLab performance. LightLab calibration is recommended after 1 year or 1000 tests, whichever comes first. Note LightLab will warn that a calibration is expired but will continue to run tests if calibration is expired. A calibration includes pump, detector, and light source service as well as a full recalibration of the system. Contact Orange Photonics Support at support@orange Photonics.com if your system needs calibration or is not working as expected.

AI-GUIDED SOFTWARE

LightLab's AI-Guided software rewrites what is possible with an HPLC. Harsh environments, complex samples, and the ever-increasing need for accuracy and repeatability are all dealt with handily by LightLab's core algorithms. Previous versions of LightLab as well as traditional HPLCs rely on preparing the system for analysis without actually sensing whether the device is ready to successfully run a sample. The AI-Guided algorithms in LightLab instead will automatically complete sample flushing, bubble purging and a host of other checks before indicating that the instrument is ready. The result is an 80+% reduction in sample failures. In addition, since LightLab knows when it is ready to go, the software saves time and consumables over a traditional HPLC instrument preparation that involves flushing for long periods of time. The best part is that the algorithm will learn over time and continue to improve and adapt as your business grows.

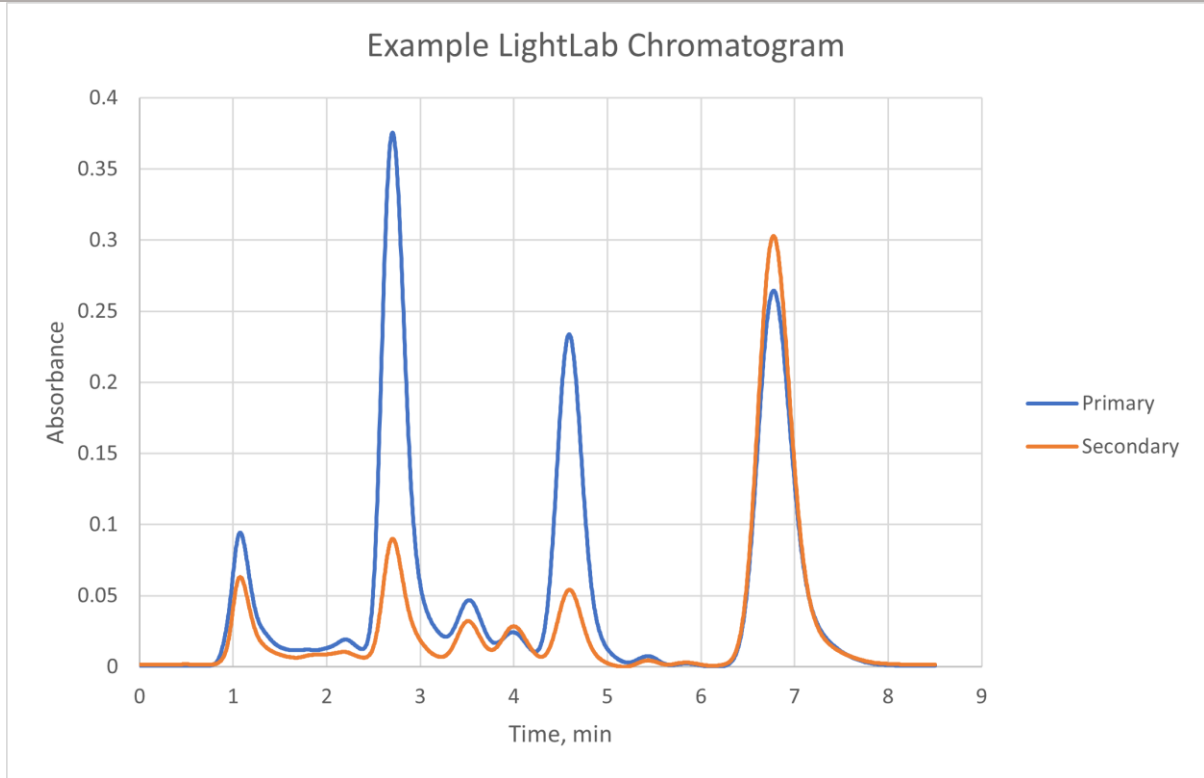
INTRODUCTION

LIGHTLAB CHROMATOGRAM AND CALCULATIONS

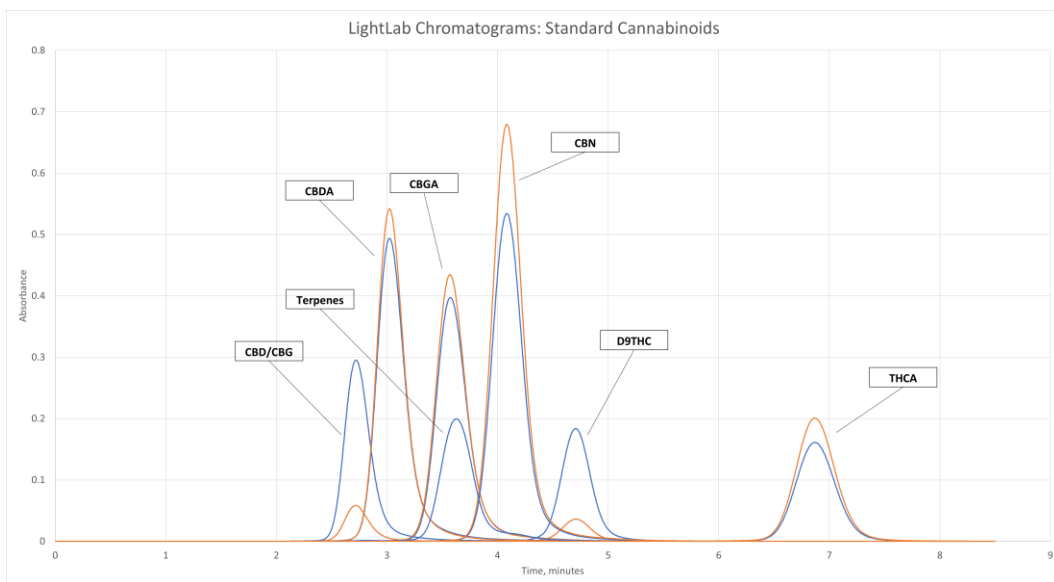
When LightLab analyzes a sample, it separates cannabinoids over time and detects them with UV light at several wavelengths. An HPLC works in much the same way, though in many cases only one wavelength of light is utilized. In a standard HPLC, the chromatogram shows peaks that represent different analytes. The area of the analyte is correlated with the concentration of that analyte. While LightLab uses the chromatogram as part of its analysis, the calculation is not a strict peak area calculation. Instead, LightLab uses a sophisticated multi-dimensional non-linear regression to calculate results. This algorithm uses multiple UV wavelengths along with the chromatogram to determine the final results. This allows for a more robust and accurate measurement of cannabinoids even with challenging environmental conditions and complex samples.

The chromatogram generated from LightLab is displayed at the end of the run and saved when data is exported. The chromatogram may be used for post processing, qualitative determination of analyte presence below the detection limit or troubleshooting. An example chromatogram is displayed below. The Y-axis represents absorbance, and the x-axis represents time. Data exported contains one second intervals. The chromatogram shows data at two wavelengths- a primary, short-wavelength channel and a secondary longer wavelength channel. Note some LightLab chromatogram peaks overlap intentionally to allow faster analysis time, however in this case the differences in UV absorbance of two target analytes is used to calculate results.

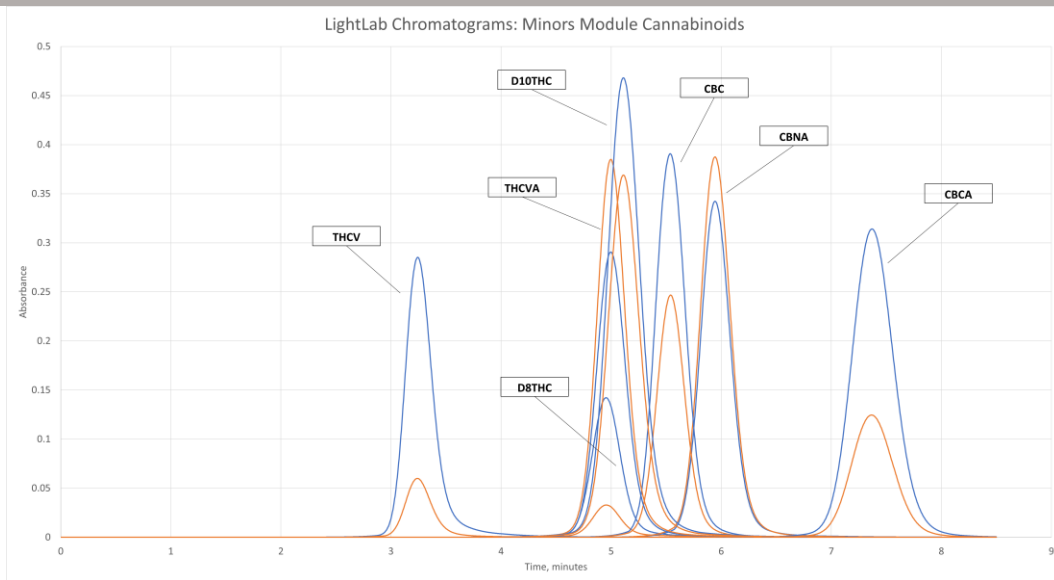
INTRODUCTION



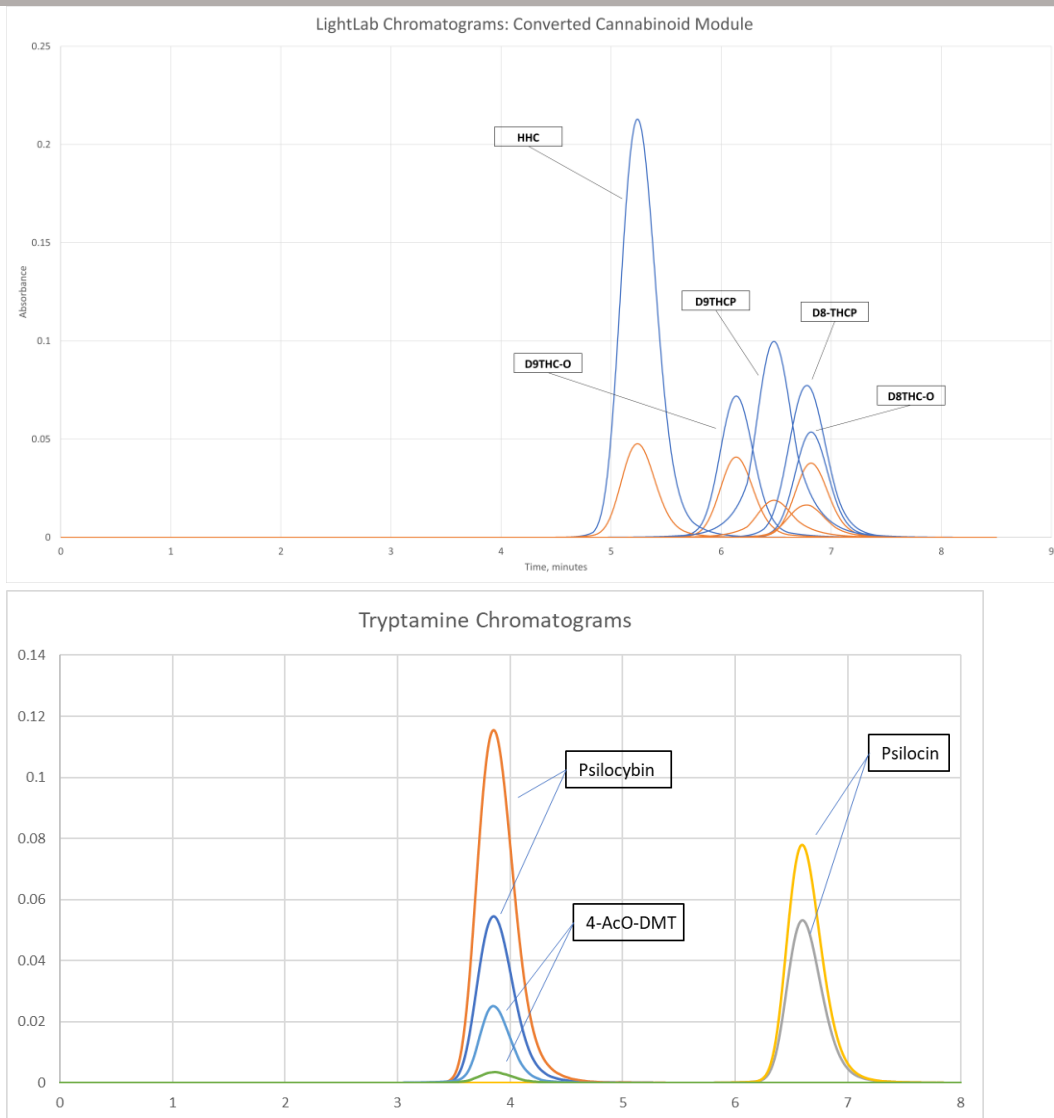
Below are chromatograms of the analytes LightLab can measure. All analytes listed are shown at approximately 8% concentration in plant mode. Note each LightLab has slightly different responsivity so chromatograms will vary from these examples, however peak timing is consistent across all LightLabs. Peak timing may vary from run to run depending on environmental conditions, column age and other factors. LightLab's algorithms take these factors into consideration when calculating results.



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ENVIRONMENTAL CONDITIONS

LightLab is a rugged device that is meant to be used in diverse environments. It is still a scientific instrument, however, and requires some care with handling. The following points provide an overview of the environmental considerations:

- LightLab can operate within a range of 55-85F (13-29C). Results obtained outside this range may be inaccurate. Note the solvent must also be within the operating range for accurate results. Note the instrument can heat up quickly if grow lights or sunlight are directly shining onto the instrument surface.
- LightLab may be stored from 32-100F(0-40C).

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- LightLab solvent may be stored from 32-100F (0-40C), however the longest life and best performance will be achieved by storing the solvent at room temperature in a dark, dry location.
- LightLab solvent has a shelf life of 1 year assuming room temperature storage. Never leave the solvent caps off the solvent containers as the solvent will evaporate and cause instrument errors. If the solvent cap has inadvertently been left off for more than 1 hour, the solvent must be discarded. If LightLab is not being used, remove the fluidics cap, and replace it with a standard cap. The fluidics caps are not airtight, and solvent can evaporate from them if left for longer than a few hours.
- LightLab contains no precision moving parts that can be damaged by bumps or drops, but large drops can damage the screen or internal components. Keep any vibration or drops to a minimum.
- Never ship LightLab without a box and padding surrounding it.
- LightLab is a liquid-based instrument. If dust or particulates are allowed to enter the internal fluidics, the device can be clogged. If you are operating in a dusty or dirty environment, take care not to contaminate the solvent, and close LightLab when not in use.
- In general, keeping the instrument clean and taking care with fluidics lines and equipment will result in a better service life and higher accuracy.

BATTERY AND CHARGING

LightLab is equipped with a Lithium-Ion battery that allows 8 hours of battery life when fully charged. Only use the supplied LightLab AC Adapter to avoid electrical damage. If you have misplaced your charger, contact Orange Photonics Support. Most airlines will allow a permanent lithium-ion battery to be brought on board and checked in luggage. The battery technology inside LightLab is similar to that of typical laptop batteries.

LIGHTLAB SCALE NOTES

LightLab comes equipped with a portable scale used to weigh samples for analysis. The accuracy of the scale and the care taken during the weighing process directly affect the accuracy of LightLab. If a laboratory grade balance is available, we highly recommend using it in place of the LightLab scale. For critical measurements, a laboratory grade balance will improve LightLab accuracy. Our engineering team has dedicated many hours to testing the portable scale that is provided with LightLab. We therefore do not recommend using any other portable scale than the one provided as many portable scales are highly inaccurate.

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LIGHTLAB STATUS BAR

On the right side of LightLab's screen, there is an orange status bar that gives information about your LightLab. Below are the meanings of each of the status bar icons:



Battery Charge: Indicates battery charge level. A plug will appear when LightLab is charging.



Updates Available: Software or calibration updates are available. Go to Settings> Updates to install updates if you have selected manual update installation. LightLab will need to reboot to apply updates.



USB Attached: Indicates that a USB drive is attached to the LightLab USB port. Data will automatically be saved to the USB when attached.



Wi-Fi Connected: Indicates wireless internet connection is active.



Ethernet Connected: Indicates ethernet internet connection is active.



No Internet: Indicates LightLab is currently not connected to the internet.



Support Portal: Indicates that support portal is open.

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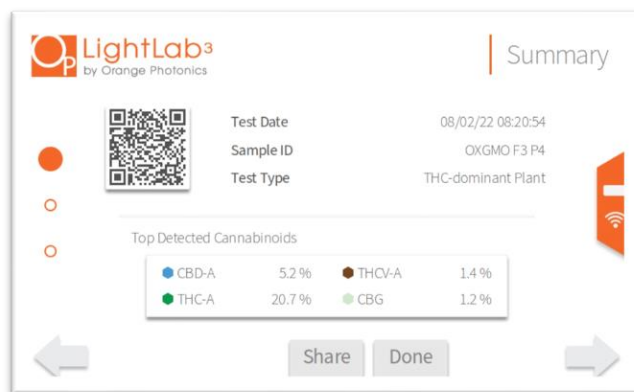


Airplane Mode: Indicates that airplane mode is on, and wireless connection is disabled.

RESULTS DESCRIPTION- STANDARD TESTS

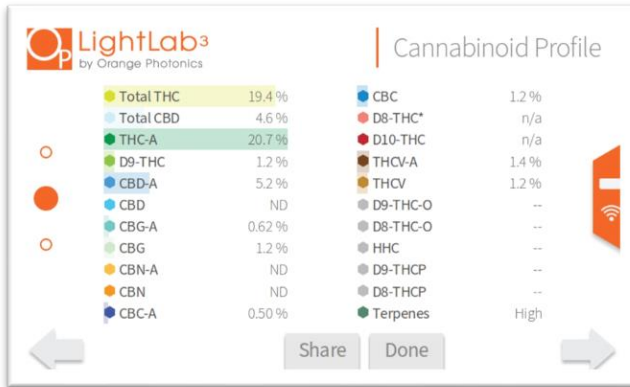
Once LightLab completes a test, a results screen will appear. The results screen has 3 pages. To switch between the pages, swipe up/down or press on the dots on the left side of the screen.

Summary Results Screen (Page 1): This screen will display general information about the test, a QR Code that can be used to view online results, certificate of analyses and share results with others (See Mobile Monitoring and Result Dashboard section for more information). The 4 highest concentration cannabinoids present in the analyzed sample are listed. Note there may be more than 4 cannabinoids detected, swipe down to page 2 view all cannabinoids. The right corner contains general information about the test that was run.



All Results Screen (Page 2): This screen will display all the cannabinoids LightLab can detect. A bar will indicate the relative concentrations of each detected cannabinoid (larger bar means more of that cannabinoid is detected). An analyte result of ND means not detected. See the “Detection Limits” section to determine the detection limit for a given test result. n/a means not analyzed. Not all analytes are analyzed for every sample type since some analytes are highly unlikely to be detected at high levels. A “--” means that the module for the given cannabinoid is not installed on your LightLab. Modules can be purchased by contacting our sales team or through our online store.

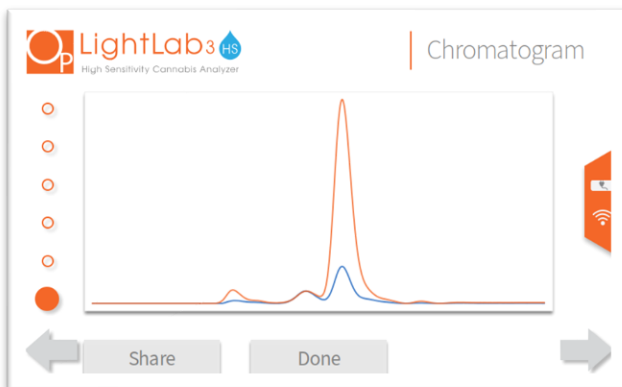
INTRODUCTION



Test Details Screen (Page 3): This screen will display test details for the current test, such as serial numbers, dates, cultivar, etc.



Chromatogram Screen (Page 4): This screen will display a chromatogram for the current test.

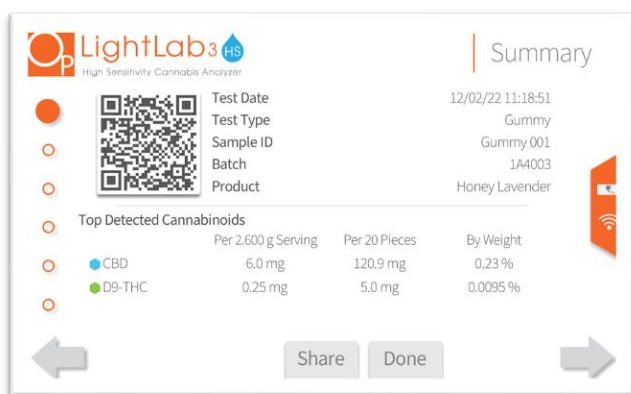


INTRODUCTION

RESULTS DESCRIPTION- EDIBLES TESTS

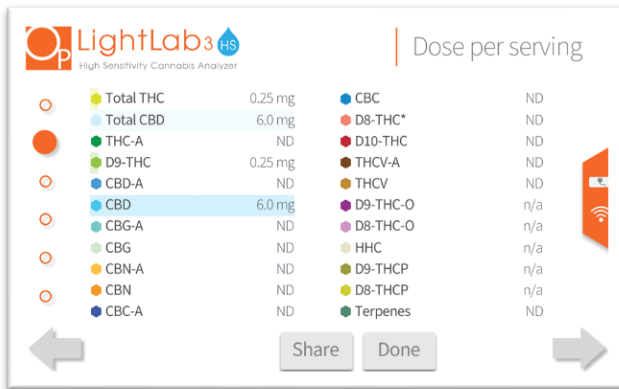
Edibles Analysis will provide additional information specific to edibles analysis. There is a total of 6 screens available upon completion of an edibles test. To switch between the pages, swipe up/down or press on the dots on the left side of the screen.

Summary Results Screen (Page 1): This screen will display general information about the test, a QR Code that can be used to view online results, certificate of analyses and share results with others (See Mobile Monitoring and Result Dashboard section for more information). The 3 highest concentration cannabinoids present in the analyzed sample are listed with results per serving, per package and by weight. Note there may be more than 4 cannabinoids detected, swipe down to page 2 view all cannabinoids. The right corner contains general information about the test that was run.

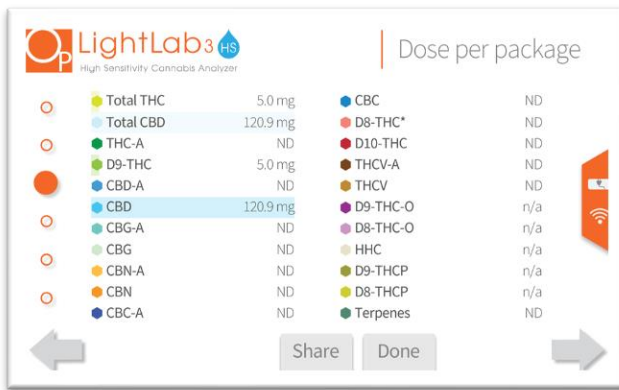


Dose Per Serving (Page 2): This screen will display all the cannabinoids LightLab can detect as a dosage per serving in milligrams. A bar will indicate the relative concentrations of each detected cannabinoid (larger bar means more of that cannabinoid is detected). An analyte result of ND means not detected. See the “Detection Limits” section to determine the detection limit for a given test result. n/a means not analyzed. Not all analytes are analyzed for every sample type since some analytes are highly unlikely to be detected at high levels. A “--” means that the module for the given cannabinoid is not installed on your LightLab. Modules can be purchased by contacting our sales team or through our online store.

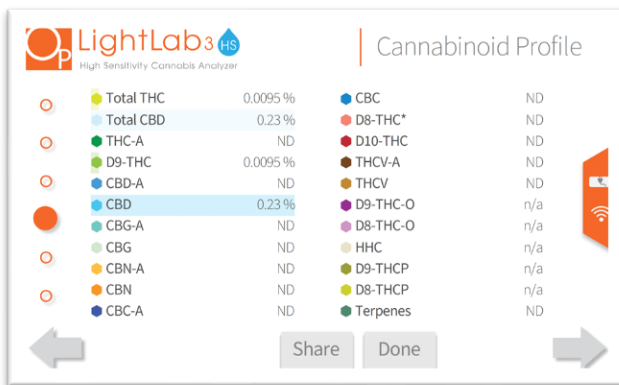
INTRODUCTION



Dose Per Package (Page 3): This screen will display all the cannabinoids LightLab can detect as a dosage per package in milligrams.



Cannabinoid Profile (Page 4): This screen will display all the cannabinoids LightLab can detect as weight percent (or volume percent if selected during analysis)

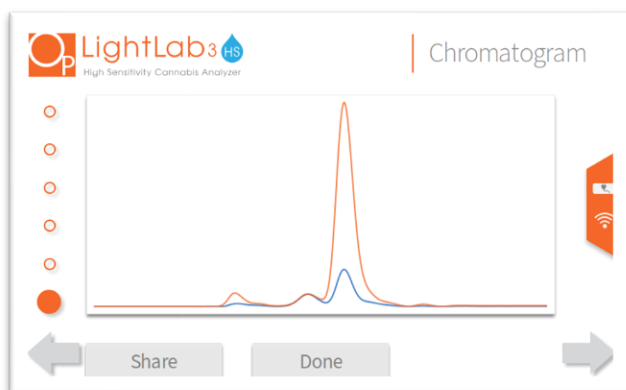


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Test Details Screen (Page 5): This screen will display test details for the current test, such as serial numbers, dates, cultivar, etc.



Chromatogram Screen (Page 6): This screen will display a chromatogram for the current test.



KEYBOARD AND BARCODE SCANNER CONNECTION

LightLab supports most USB keyboards and barcode scanners including wireless devices for entry of sample tags and notes. To connect a keyboard or barcode, simply connect the keyboard to the USB port located on the side or back of the instrument. Note LightLab also has an on-screen keyboard, so connecting a keyboard is optional. By connecting a barcode scanner to a LightLab HS, it is possible to start preset SOPs.

GETTING STARTED

The following tips will help you get started without issues. We are here to help so please contact Orange Photonics Support if you run into any troubles or questions.

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1. **Warm up your Instrument** – Always warm up your instrument if it has been unused for more than 2 hours. Failing to warm up the instrument will result in poor performance. If possible, allow 20 minutes for LightLab to acclimate before using.
2. **Run Flower First** - We recommend running flower samples the first few times you use LightLab. It's the easiest kind of sample to run and will help you get acquainted with the sample prep process.
3. **Column Storage** - When you shut down LightLab remove the Selective Separation Column (SSC) from LightLab and store the SSC with the supplied caps on both ends of the column to help it stay “wet”.
4. **Sample Prep Matters** - Careful sample preparation, especially weighing the sample is important for accuracy. Make sure your scale is calibrated and level, and that you follow instructions carefully.
5. **Don't Skimp on Extraction** - The shaking times should never be shortened. Doing so will result in low results. Shaking longer does not cause issues. For concentrates, make sure the sample is fully dissolved. If it isn't, repeat the shake cycle again. For crude oil samples, a sample heater may be required. Orange Photonics provides a sample warmer for sale separately.

MOBILE MONITORING AND RESULT DASHBOARD

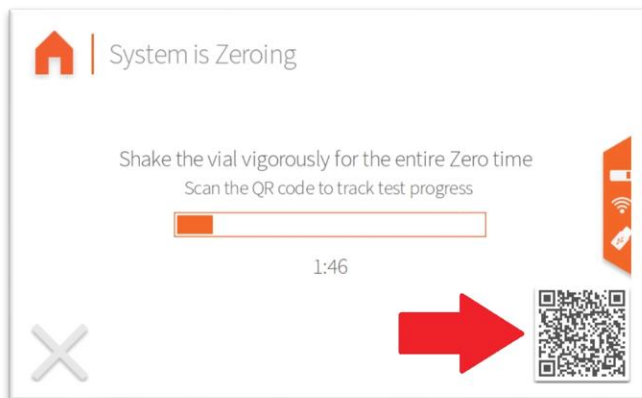
Mobile Monitoring and Result Dashboard

If your LightLab is connected to the internet, enhanced features can be accessed via a QR code that is displayed once a sample run is started as well as at the end of a sample run. By accessing the web link embedded in the QR code, it is possible to do the following:

1. View the status and time remaining of a current test that is running.
2. Get notified on your phone or computer when a sample is ready to be injected, or results are ready.
3. View, share and download results via the result dashboard web page.
4. View, share and download a .pdf Certificate of Analysis onto your phone or computer.

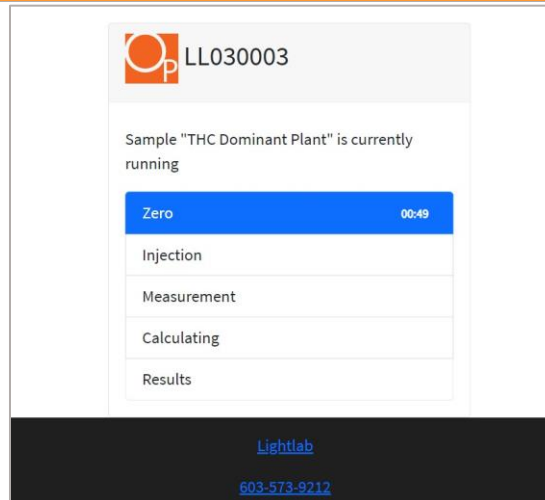
MOBILE MONITORING

Mobile monitoring allows viewing current sample run status while the instrument is running. To use this feature, take a picture of the QR code that appears at the start of a sample run using your smartphone and then open the link. Some smartphones may require a dedicated QR code reader app.



Once the QR link is opened, you will be directed to a page that shows the status of the current test as shown below, which mirrors the status on LightLab's screen. Note your phone may ask for permission to display notifications. Select "yes" if you would like to be notified on your phone when action is needed from your LightLab.

MOBILE MONITORING AND RESULT DASHBOARD



Once an analysis is complete, the result dashboard will appear on the same page automatically.

RESULT DASHBOARD

Once a sample analysis is complete, a result dashboard is created. This is a web page that contains information about the analysis as well as options for accessing and sharing the data. The result dashboard is a permanent web page for the sample that was run and can be accessed later by anyone that has the link. This page can be shared with others, and even shared via social media apps.



| | |
|-----------|-------|
| THC-A | 9.2% |
| Δ8-THC | 6.3% |
| Total THC | 14.3% |
| CBD-A | ND |
| CBD | ND |
| Total CBD | ND |
| CBG-A | ND |
| CBG | ND |
| CBN | ND |
| CBC-A | ND |
| CBC | ND |
| CBN-A | ND |
| Δ8-THC* | ND |
| Δ10-THC | ND |
| Terpenes | Low |

| | | | |
|-----------|-----------------------------|-------------|---------|
| Name | Mother Orange | Weight | 0.095 g |
| Date | 6/22/2021 1:50:20 PM -04:00 | Solvent | 10 ml |
| Test Type | Custom % | Temperature | 27.4 °C |
| | | Moisture | 0.0% |

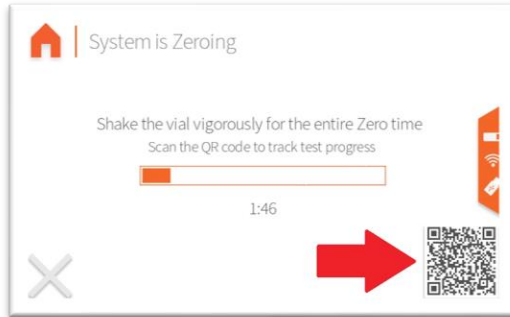


MOBILE MONITORING AND RESULT DASHBOARD

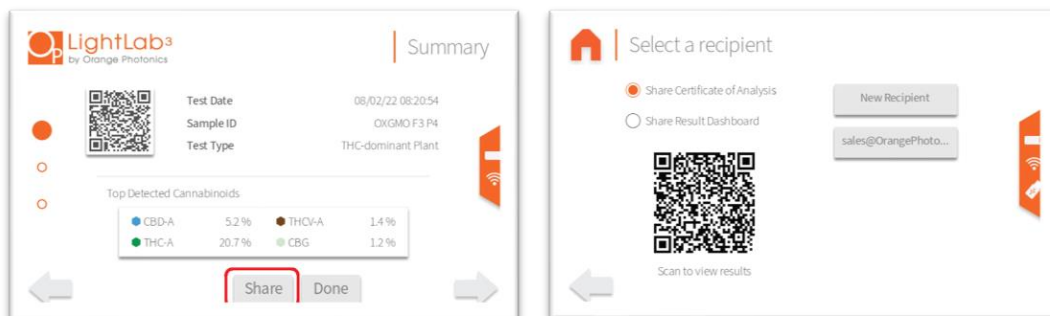
Accessing the Result Dashboard

There are several ways to access the result dashboard:

1. From the mobile monitoring QR Code.



2. From the QR Code on the results screen or by pressing the “Share” button on the LightLab results screen. Note you can select whether the QR code contains a link to the result dashboard or a link to directly download a certificate of analysis.



3. Via text or email feature on the LightLab share results screen. Note you can select whether the text/email shared contains a link to the result dashboard or a link to directly download a certificate of analysis.
4. Via a link contained in the USB drive connected to LightLab. Each test result will have its own folder, and within that folder a hyperlink for the result dashboard will be present.

Result Dashboard Features

The result dashboard contains the following parts:

- Analysis results for the particular sample that was analyzed.
- Test information (Date, Test Type, Weight, Solvent Temperature, Moisture Content)
- Sample Tags (Sample ID, Cultivar, Operator)
- Buttons for sharing and accessing the results.

MOBILE MONITORING AND RESULT DASHBOARD

To share results, press the blue “Share Results” button. Most phones and computers will allow several sharing options (text, Facebook, email, Instagram, etc.). If you want to share your results via social media, we recommend posting the results dashboard link since this will pre-populate with a link preview and can be accessed and shared further by others.

To download results to an excel compatible .csv file, click the gray .CSV link.

To generate and download a Certificate of Analysis, click the Yellow “certificate of analysis” button.


MOBILE MONITORING AND RESULT DASHBOARD

CERTIFICATE OF ANALYSIS

A certificate of analysis can be generated for any test result that contains information that is similar to any testing lab report. The certificate of analysis can be accessed in the following locations:

1. From the QR Code accessed by pressing the “Share” button on the LightLab results screen. Note you can select whether the QR code contains a link to the result dashboard or a link to directly download a certificate of analysis.
2. Via text or email feature on the LightLab share results screen. Note you can select whether the text/email shared contains a link to the result dashboard or a link to directly download a certificate of analysis.
3. From the Result Dashboard.

The certificate of analysis contains detailed information about the test result. We recommend using the certificate of analysis to share results with a client, customer or other interested party that needs detailed and secure information about a test.


Certificate of Analysis

| | | |
|---|-------------------------------|--------------------|
| Date: 2022-08-02T08:20:54 | Method: LightLab HPLC | LightLab HPLC |
| LightLab: McArdle Farms LightLab | Test Type: THC-dominant Plant | THC-dominant Plant |
| Serial: LL030207 | Moisture: 0.0% | 0.0% |
| Operator: D. Wilks | Weight: 0.3 g | 0.3 g |
| | Solvent: 30 ml | 30 ml |
| Sample ID: OXGMO F3 P4 | Temperature: 24.6 °C | 24.6 °C |
| | Cultivar: Orange X GMO | Orange X GMO |
| Notes: Density 7/10, easy trim, garlic/gas/citrus | | |

Cannabinoid Profile


| Analyte | LOQ | % | Analyte | LOQ | % |
|------------------|------|-------------|----------|------|------|
| THC-A | 0.10 | 20.7 | Δ8-THC* | -- | n/a |
| Δ9-THC | 0.10 | 1.2 | Δ10-THC | -- | n/a |
| CBD-A | 0.10 | 5.2 | THCV-A | 0.10 | 1.4 |
| CBD | 0.10 | ND | THCV | 0.10 | 1.2 |
| CBG-A | 0.10 | 0.62 | Δ9-THC-O | -- | -- |
| CBG | 0.10 | 1.2 | Δ8-THC-O | -- | -- |
| CBN-A | 0.10 | ND | HHC | -- | -- |
| CBN | 0.10 | ND | Δ9-THCP | -- | -- |
| CBC-A | 0.10 | 0.50 | Δ8-THCP | -- | -- |
| CBC | 0.10 | 1.2 | Terpenes | | High |
| Total THC | | 19.4 | | | |
| Total CBD | | 4.6 | | | |

ND = Not Detected; n/a = Not Analyzed; LOQ = Limit of Quantification; Total THC = (0.877 x THC-A) + Δ9-THC; Total CBD = (0.877 x CBD-A) + CBD. * Δ8THC has lower precision and higher detection limit than other cannabinoids

Approved _____

Date _____

The signatory confirms that the Operator has performed the sample preparation according to the LightLab User's Guide. This report is for quality assurance purposes only. These results relate only to the sample included on this report. Orange Photonics makes no claims as to the efficacy, safety, or risks associated with any detected or non-detected level of any compounds reported herein. Orange Photonics makes no claims regarding the adherence to sample preparation guidelines, by the operator, as outlined in the LightLab User's Guide.



Scan for Authenticity

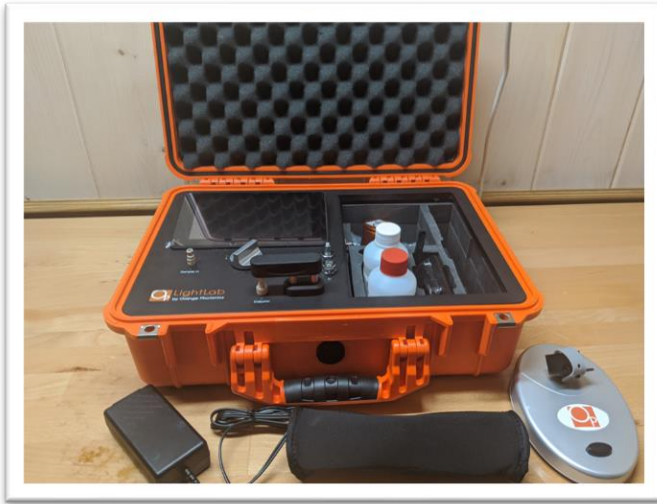
Orange Photonics, Inc. (603) 573-9212. OrangePhotonics.com
r20220707-1

FIRST TIME USE

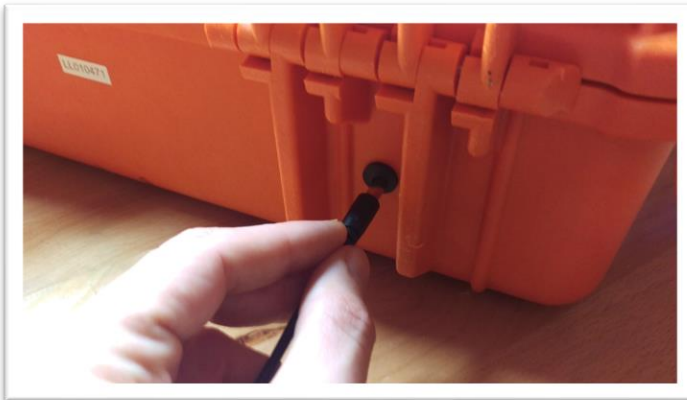
First Time Use

Before using LightLab for the first time, a few things need to be set up. To complete the first-time setup, follow these instructions:

1. Open LightLab and remove fluidics pouch and power supply.



2. Plug in LightLab if power is available (LightLab has an 8-hour battery).



3. Press the power button to turn on LightLab. It will take approximately 30 seconds for LightLab to start up.
4. Once startup is complete, a first-time setup screen set will appear. Follow the on-screen instructions. The following will be set up:
 - a. Acceptance of Terms and Conditions
 - b. Naming LightLab (optional)
 - c. Setting up internet connection
 - d. Adjusting Date/Time

FIRST TIME USE

5. Once the first-time setup is complete, the warmup screen will appear. First time warmup may take longer than typical warmup times in order to prime the system for first use. Follow instructions in LightLab setup to begin using the instrument.

LIGHTLAB GRINDER OPERATION

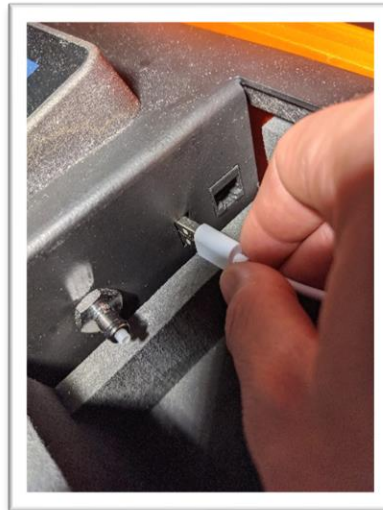
LightLab Electric Grinder Instructions

INTRODUCTION

LightLab grinder should be used to prepare dried plant material for analysis with LightLab. The grinder will break up the sample into small, homogenous particles for efficient cannabinoid extraction during sample preparation. The LightLab grinder is powered by a rechargeable battery. If your LightLab has an older hand grinder, the electric grinder may be purchased by visiting the Orange Photonics store at www.OrangePhotonics.com/store

FIRST TIME USE AND CHARGING

1. Before using your grinder, we recommend fully charging the grinder. The grinder contains a rechargeable battery. The battery should last for 10-20 runs.
2. To charge the grinder, plug in the included USB-C cord into the back of the grinder and plug the other end of the cord into any USB power source. The USB port on the side of the LightLab may be used to charge the grinder.

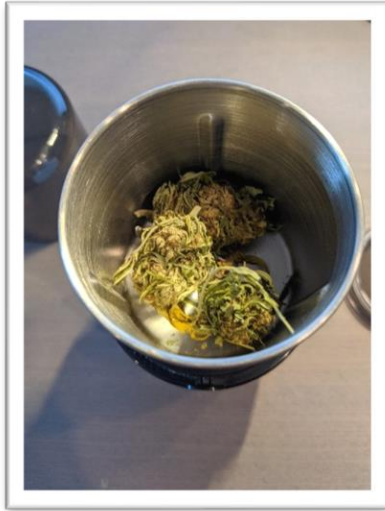


USING THE LIGHTLAB GRINDER

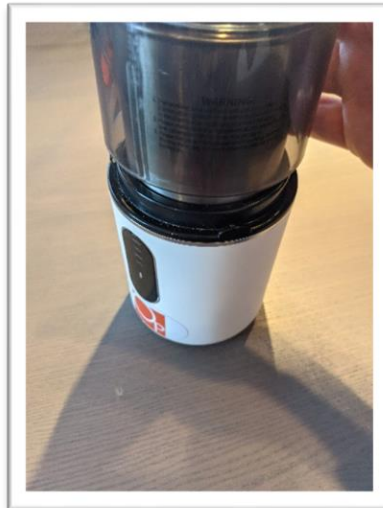
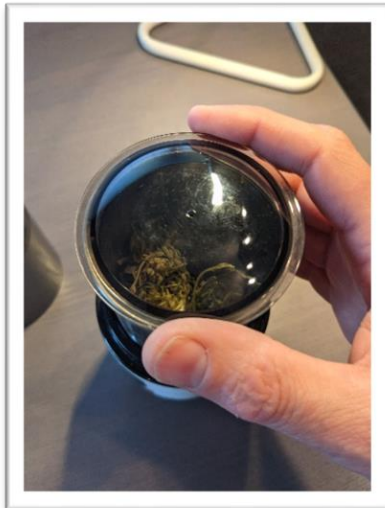
1. Ensure the grinder is clean before adding sample to avoid cross contamination with previous tests (see Cleaning the Grinder for cleaning instructions)
2. Add plant sample to grinder using the following guidelines:
 - a. Use at least a gram (one medium sized bud) of sample. The more sample added, the more consistent the LightLab results will be since the sample will be more representative of the whole lot/plant. If plenty of sample is available, fill the grinder about halfway.

LIGHTLAB GRINDER OPERATION

- b. If taking a sample from a container or bag, take sample from the top, middle, and bottom of the container/bag to ensure a representative sample.
- c. If taking a sample from the plant, take samples from multiple locations on the plant if an average of the plant is desired. Take samples from multiple plants if an average of multiple plants is desired.
- d. If hemp compliance testing, follow your local guidelines for sampling. Generally, this means taking the top 6-12" of a plant.



3. Place the top cover on the grinder, and then place the plastic shield over the top.

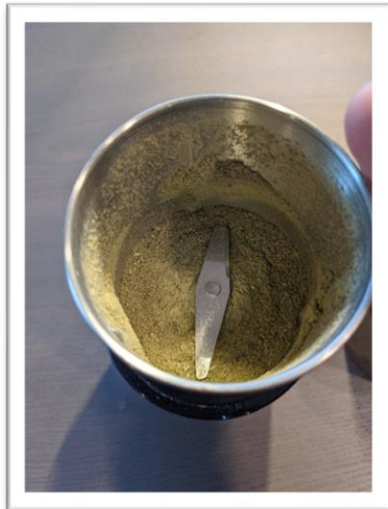


4. Press the top shield down to start the grinder. Keep the shield pressed down until the grinder stops (20 seconds).

LIGHTLAB GRINDER OPERATION



5. Remove the shield and cover and check to be sure the sample is fully homogenized. If not, replace the cover and shield and run the grinder for another 20 seconds.

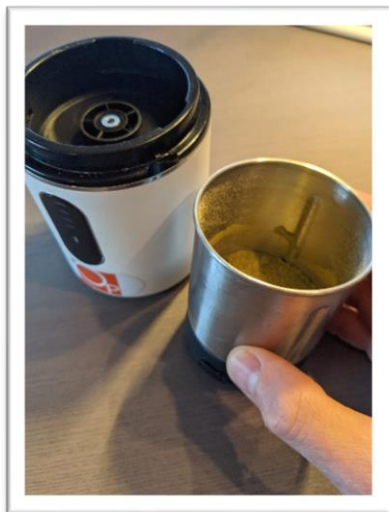


6. Your sample is now ready to be analyzed. Note LightLab typically uses between 0.2-0.5g of sample for analysis. Follow the on-screen LightLab instructions for preparing your sample for analysis.

LIGHTLAB GRINDER OPERATION

CLEANING THE GRINDER

1. Dispose of any extra sample in the grinding cup. Note the metal cup may be removed by twisting the cup 1/8 turn counterclockwise.



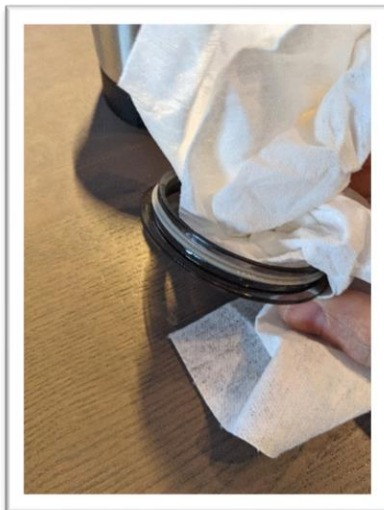
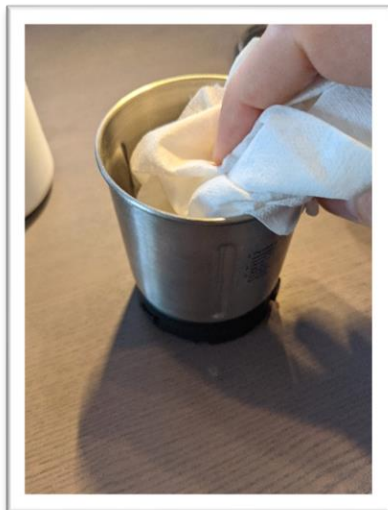
2. Add a few milliliters of denatured alcohol or ethanol to the grinder cup (enough to fill the cup until the solvent reaches the blades). In a pinch, LightLab solvent may be used. LightLab solvent contains water, so after using LightLab solvent it is important to wipe the cup and cap dry before the next use.



3. Replace the cap and shield and press down on shield to start the grinder. Let the grinder run for about 10 seconds.
4. Remove the shield and cap, then dispose of the alcohol or LightLab solvent.
5. Repeat the above steps a second time to ensure the cup is clean. There should be no visible plant material after this second cleaning. If there is still plant material present, repeat the process again until clean.

LIGHTLAB GRINDER OPERATION

6. Dry the cup and cap with a clean towel or wait for the solvent to evaporate. Ensure the cup and cap are dry before the next sample is added.



LIGHTLAB SETUP

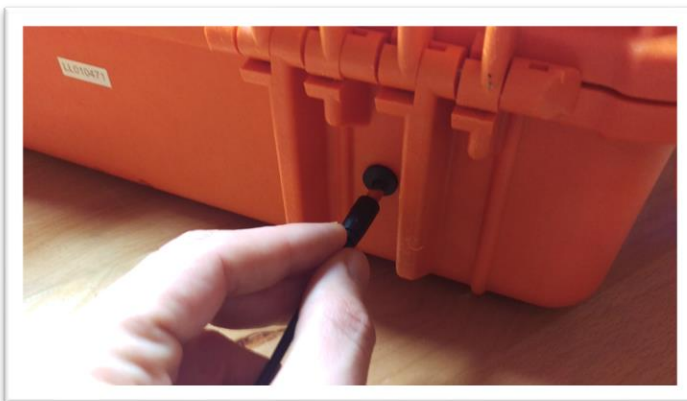
LightLab Setup

For LightLab 3 Canna, HS and Psy models one set of solvents and columns will be used. For LightLab Psy+Canna, there are two sets of solvents. Be sure to select the correct solvent and column for sample types you will be running. The standard LightLab 3 solvent and column for cannabis analysis is labeled in orange, and the Psy solvent and column is labeled in purple.

1. Open LightLab and remove fluidics pouch and power supply.

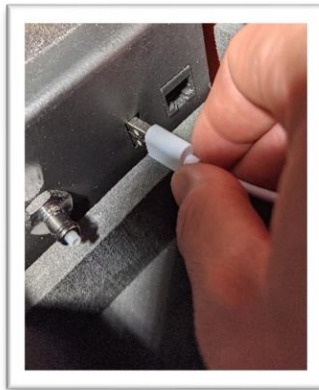


2. Plug in LightLab if power is available (LightLab has an 8-hour battery).

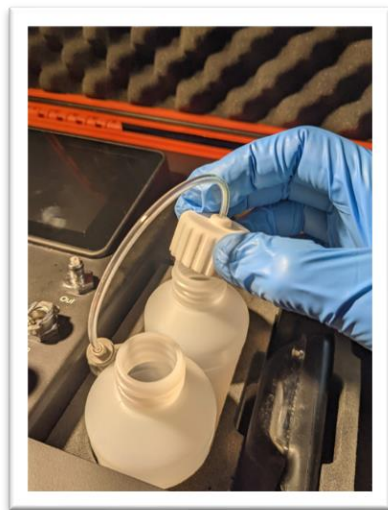


LIGHTLAB SETUP

3. Plug in shaker power cord to peripheral port or USB connection (depending on LightLab model). Connect the other end to the shaker.

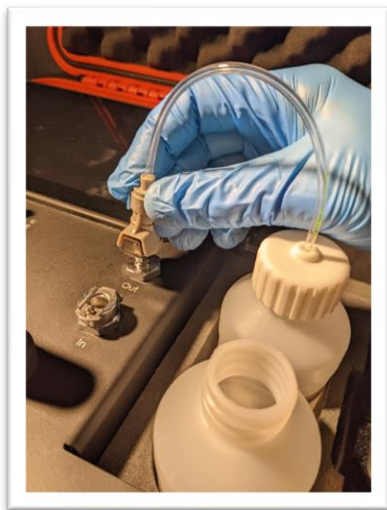


4. Remove waste cap from baton/bag and place on waste container.

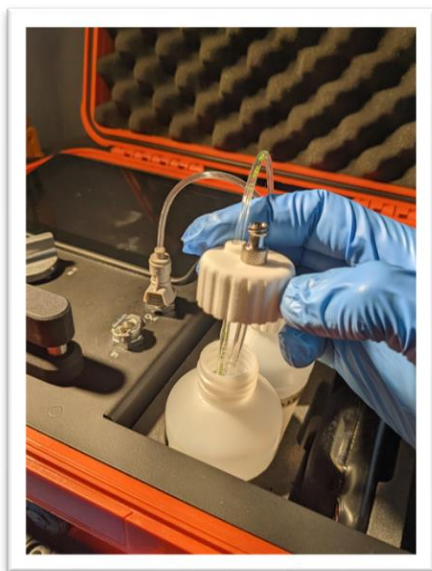


LIGHTLAB SETUP

5. Attach fluidics line to the “Out” connector on LightLab. Note the metal button on the connector may need to be depressed before it can be attached.

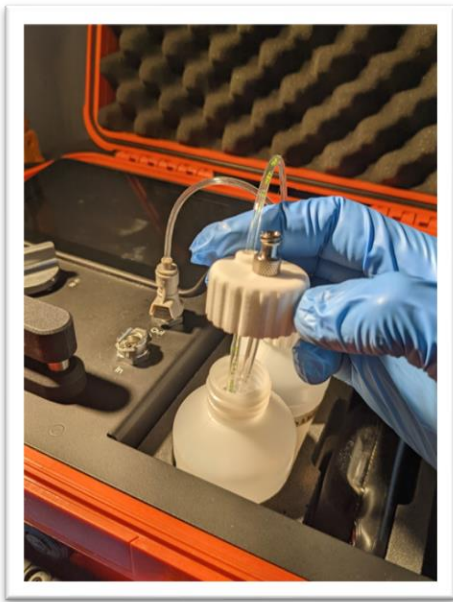


6. Remove solvent cap from the zippered bag and place it in solvent container with the metal fluidics weights inside the bottle. Never place the sample fluidics onto a waste container.

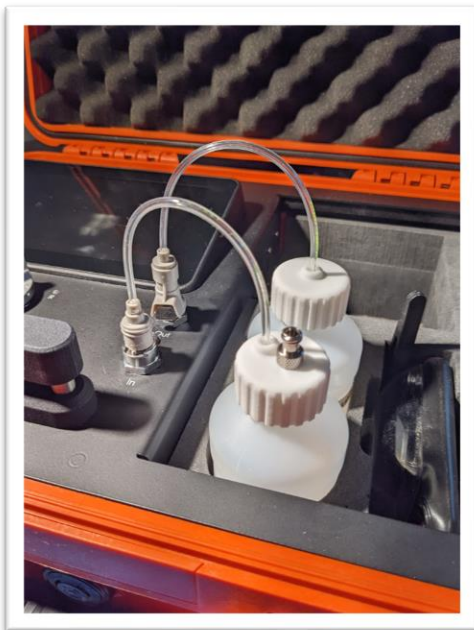


LIGHTLAB SETUP

7. Attach fluidics line to the “In” connector on LightLab. Note the metal button on the connector may need to be depressed before it can be attached.



8. Once complete LightLab will look like this. Note older cap styles may have connectors on the caps. Orange Photonics recommends replacing these caps with newer style caps to reduce the chances of bubbles causing errors.

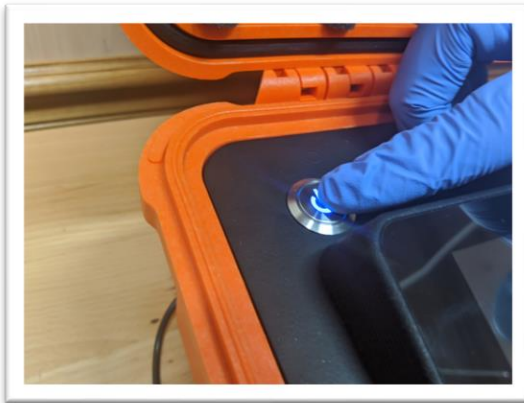


LIGHTLAB SETUP

9. Remove Selective Separation Column caps, lift column holder and insert column. Close the holder on the column firmly. Note for psychedelics analysis, always use the purple banded column. For cannabis analysis use the orange banded column.



10. Turn on LightLab. Startup will take approximately 30 seconds.

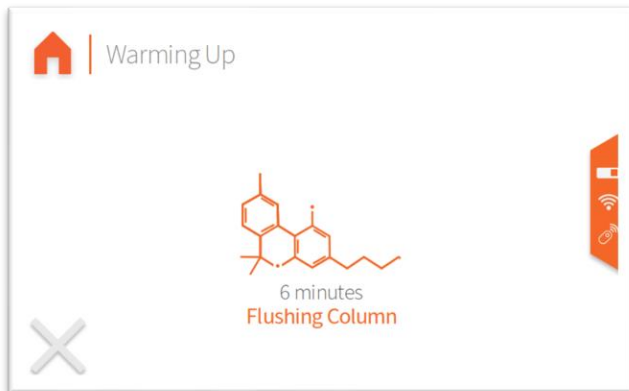


11. Press "Start Warmup" to begin the warmup process. NOTE: the warmup can be skipped if the solvent caps and fluid connections have not been disconnected and the system has been running recently (within one hour). For Psy+Canna instruments, select the appropriate warmup button depending on the types of samples to be run.

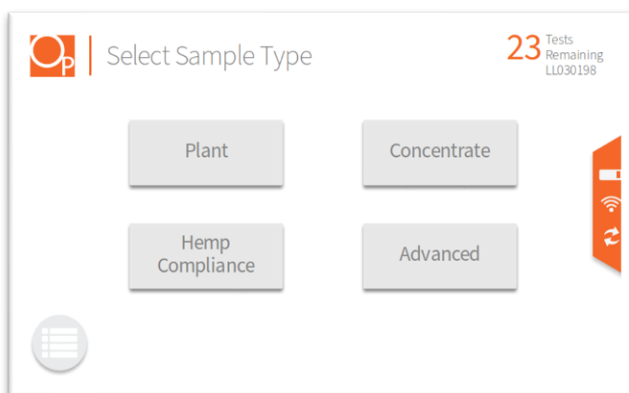
LIGHTLAB SETUP



12. Warmup will begin and give an estimated time until complete. The actual time may vary depending on LightLab's determination of the system readiness. The time shown is the best guess at the required timing and will update as the warmup progresses.



13. Once complete, LightLab will show the home screen. You are now ready to begin testing. Note depending on the options available on your LightLab the home screen buttons may differ.



LIGHTLAB SETUP

LIGHTLAB PSY+CANNA: SWITCHING BETWEEN MODES

LightLab Psy+Canna models are capable of measuring both cannabis and psychedelics. Each application uses a different set of column and solvent. LightLab must be set up and warmed up using the correct solvent and column in place. To switch to the other mode, repeat the setup procedure but use the other column and solvent. Never mix the LightLab Canna and Psy solvents or columns.

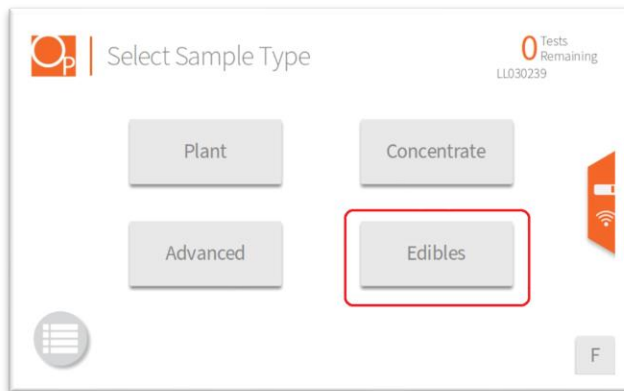
SAMPLE ANALYSIS- EDIBLES (HS ONLY)

Sample Analysis- Edibles (HS and Psy+Canna Only)

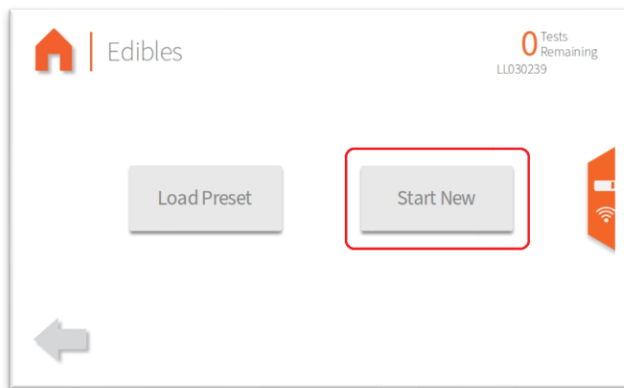
LightLab 3 HS includes a user interface that is specifically tailored to edibles manufacture and analysis. The workflow to set up an edibles analysis is similar across all edibles; however, the specific sample preparation steps depend on the type of edible analyzed.

STARTING A NEW EDIBLES TEST

1. Select the Edibles button from the main menu.



2. To start a new test, select "Start New".

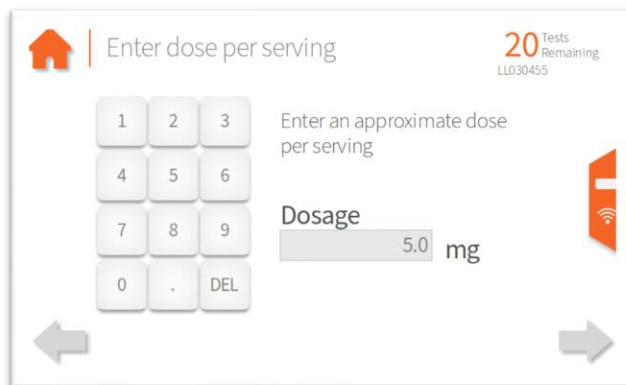


SAMPLE ANALYSIS- EDIBLES (HS ONLY)

- Next, the list of edible types available will be displayed. Selecting an edible type will provide a more detailed description of the edible type.



- Once an edible type is selected, enter the approximate dosage of the edible to be analyzed. This need not be an exact dosage. If more than one cannabinoid is present, entered the highest cannabinoid dosage. For example, if a gummy with approximately 5mg D9THC and 2mg CBD is to be analyzed, the dosage should be set to 5mg. This number is used to get LightLab sample preparation into the correct range, so an exact dosage is not required.



SAMPLE ANALYSIS- EDIBLES (HS ONLY)

- Next, enter the serving size of the edible. This is the weight or volume of the edible that contains one dose. For example, if a 5mg gummy weighs 2.5g, then 2.5g would be entered here.

Home | Serving Size 20 Tests Remaining
LL030455

Enter a serving size in g

Serving size g

1 2 3
4 5 6
7 8 9
0 . DEL

- Next, enter the number of servings per package. For example, if a package of gummies contains 20 gummies, the number entered here would be 20. If the sample being tested contains only 1 dose, enter 1 for the package size. For example, an infused beverage with a single 5mg dose would require entering 1 for the package size.

Home | Servings Per Package 23 Tests Remaining
H Ese

Enter the number of servings per package

Package size servings

1 2 3
4 5 6
7 8 9
0 . DEL

SAMPLE ANALYSIS- EDIBLES (HS ONLY)

7. Once the dosage and serving information is entered, information about the sample to be analyzed is entered next. None of the sample information is required, but it is recommended that information is entered so that test data can be tracked more easily. Note at least one of the top two information bars, Product and SKU are required if a preset is to be saved (See section on Saving Presets below).

| | |
|-----------|----------------|
| Product | Honey Lavender |
| SKU | 851601006126 |
| Batch | 1A4003 |
| Sample ID | Gummy 001 |
| Operator | DW |
| Notes | Enter a notes |

After all information is entered, a test summary screen will appear. There are 3 sections displayed:

- The left column gives sample information entered previously.
- The middle column displays information about the dosage, serving size and servings per container entered previously.
- The right column shows information about the analysis. LightLab uses a sophisticated algorithm to determine the sample size, extraction solvent amounts and type of solvent is used for extraction. The information on dosage and sample size as well as the type of edible selected are inputs to this algorithm. The “Sample Size” is the amount of sample that will be required to weigh out for analysis. The “Extraction Type” shows the types of LightLab solvent that will be used for extraction. There are three options that depend on the edible sample type selected.
 1. Solvent A/B Mix: LightLab Solvent A will be used for primary extraction, and Solvent B will be added extraction to ensure the chemistry is correct for injection into LightLab. Solvent A is primarily methanol-based and can be used for sample types that are dissolvable/extractable in alcohols. Solvent B contains significantly more aqueous components and can be used for samples more readily dissolved in water. In either case, an equal amount of Solvent A and Solvent B is always included before injection into LightLab.

SAMPLE ANALYSIS- EDIBLES (HS ONLY)

2. Solvent B/A Mix: LightLab Solvent B is used for extraction and Solvent A is added after extraction before injecting into LightLab. This mode is generally used for samples that are soluble in water.
3. Direct Inject: Some samples, for example beverages, can be directly injected into LightLab without any sample preparation. Direct inject indicates that no sample preparation is required prior to injection and analysis.

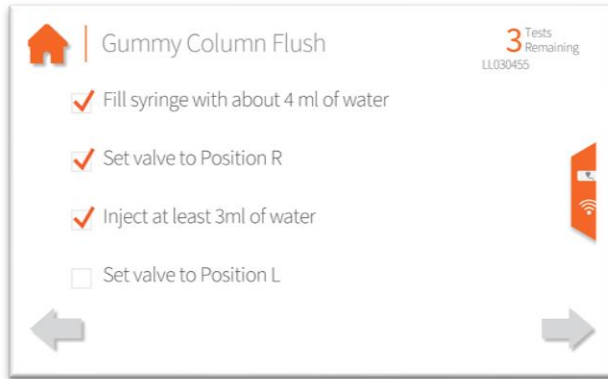
| Sample Type | Dose | Sample Size |
|----------------|------------------------|-----------------|
| Gummy | 5.0 mg | 0.500 g |
| Product | Serving Size | Extraction Type |
| Honey Lavender | 2.6 g | Solvent B/A Mix |
| SKU Code | Servings Per Container | Solvent Volume |
| 851601006126 | 20 | 20 ml |
| ID | Gummy 001 | |
| Notes | | |

8. The “Save Preset” button will save a preset that allows skipping information on sample and dosage for faster analysis. See the section “Saving Presets” below for more information.
9. After the test summary is displayed, selecting the forward arrow will begin the analysis. The specific instructions displayed will depend on the sample type selected. Several steps are common between different sample types and are described below.
10. For all samples, LightLab requires a flush before analysis. The flush clears the sample loop before analysis and ensures that no cross contamination occurs when the valve is moved. The flush requires injecting approximately 3ml into the LightLab Sample In port. The valve should not be moved during the injection.

- Fill clean syringe with at least 3ml solvent
- Attach syringe to Sample In port. DO NOT move valve position
- Inject about 3ml of solvent

SAMPLE ANALYSIS- EDIBLES (HS ONLY)

11. For water soluble samples including gummies and hard candies, LightLab requires a water injection prior to sample analysis. By injecting water into LightLab, the column will be cleared of potential contaminants and primed for analysis of water-soluble samples. Using clean, preferably distilled water is recommended. Never use contaminated or dirty water to prime LightLab. Once water is injected, LightLab will run for 10 seconds to move the injected water through the column.



12. QR Codes are displayed that link to sample preparation instructional videos for most sample types. Capture the QR code with a mobile device to watch videos about sample preparation best practices. In addition to QR codes, LightLab displays on-screen standard operating procedures that guide sample preparation and analysis. Your samples may require adjustments to these standard operating procedures. Contact Orange Photonics support if your samples don't conform to any supported products or if assistance is needed with sample preparation or SOPs.



SAVING PRESETS

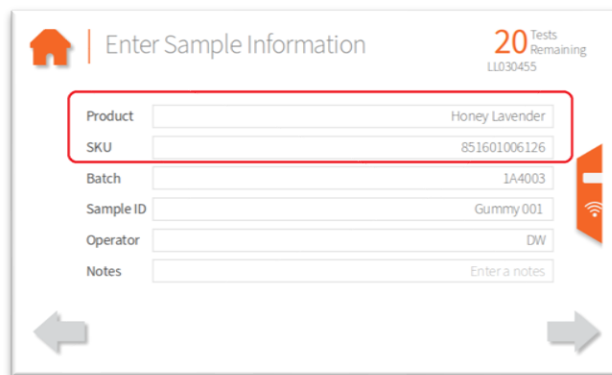
Presets are saved SOPs that allow faster analysis of samples frequently tested. For example, a preset may be saved for a particular product type or flavor. If a preset is

SAMPLE ANALYSIS- EDIBLES (HS ONLY)

saved, accessing that saved preset will load the sample type, sample name, SKU/barcode, dosage, serving size and servings per container. Saving presets can save time and ensure consistent analysis of products that are tested frequently.

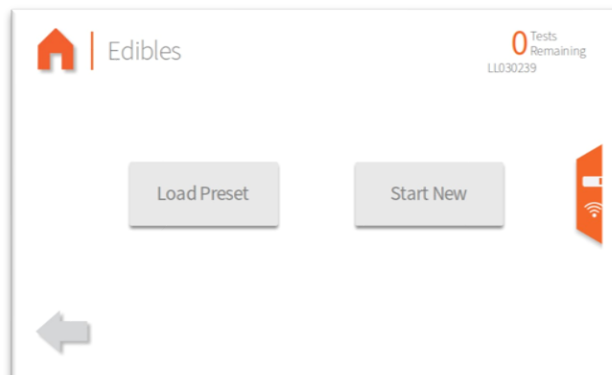
A preset may be saved as follows:

1. Start a new edibles analysis.
2. Enter information about sample types and dosages.
3. When prompted to enter sample information, enter a Product Name and/or SKU. These fields are used to start a preset later. Note if a SKU is saved, LightLab can automatically start a saved preset simply by scanning the SKU.



Once the preset is saved, it can be accessed in two ways:

1. Select “Load Preset” from the edibles menu. A list of saved presets will appear. Presets may be loaded or deleted from this menu.



2. If a SKU or barcode is scanned, LightLab will automatically load a preset. We recommend saving SKUs if your product has them so that a test may be started by simply scanning that SKU.

SAMPLE ANALYSIS- EDIBLES (HS ONLY)

Once a preset is loaded, the sample information may be entered. Note the Product and SKU will be automatically loaded from the preset. The other fields may be entered to provide information about a particular sample but are not required for analysis.

WEIGHT VS VOLUME PERCENT

For liquid samples, LightLab can display either weight percent or volume percent. Weight percent provides the percentage of analyte by weight, whereas volume gives the percentage of analyte by volume. For example, if a liquid sample weighs 100g, and is 10% CBD *by weight*, there is 10g of CBD in the sample. If a liquid sample of 100ml has 10% CBD *by volume*, there is 10ml of CBD in the sample.

Weight percent and volume percent are related to each other by the density of the liquid. If the density is 1 (for example, water has a density of 1), the numbers are identical. The following equation may be used to convert volume to weight and vice versa:

$$\% \text{ Weight} = \% \text{ Volume} * \text{Density} \left(\frac{g}{ml} \right)$$

Both weight and volume percent are selectable for liquid beverage enhancers, liquid nanoemulsions, tinctures (mg/ml) and custom modes. Weight percent is always recommended since it is more accurate to weigh a sample than it is to deliver a volume. If you are unsure, use weight percent. Volume percent should only be used if you are comparing LightLab to a laboratory that uses volume percent.

For beverage analysis up to 0.1 mg/ml (approximately 30mg in a 12oz/355ml bottle), LightLab always reports in volume percent since the sample will be directly injected with no sample preparation. Since there is no preparation step, this represents the most accurate measurement mode for beverages. Note for most beverages, the density is close enough to 1 that volume percent and weight percent are nearly identical.

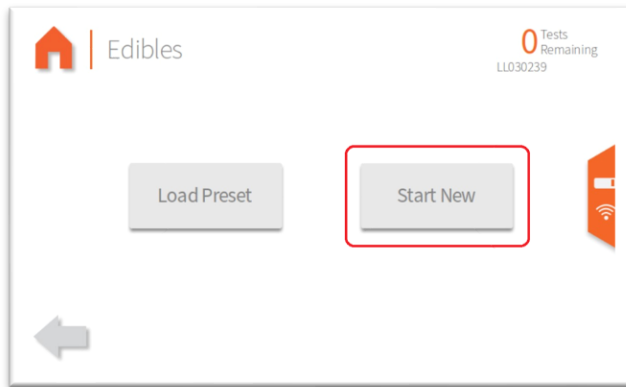
SAMPLE ANALYSIS- PSY

Sample Analysis- Psychedelics (Psy and Psy+Canna Only)

LightLab 3 HS includes a user interface that is specifically tailored to psychedelics analysis. The workflow to set up a psychedelics analysis is similar across all samples; however, the specific sample preparation steps depend on the type of edible analyzed.

STARTING A NEW TEST

1. To start a new test, select “Start New”.



2. Next, the list of sample types available will be displayed. Selecting a sample type will provide a more detailed description.



3. Psychedelics analysis has two sample entry types: standard and edible. Edibles have a more detailed sample entry that requires information about the sample size and package size. This information is used to calculate the dosage of the sample per unit and per package.
4. FOR CUSTOM EDIBLE MODE ONLY: Enter the approximate dosage of the edible to be analyzed. This need not be an exact dosage. If more than one psychedelic is present, enter the highest psychedelic dosage. For example, if a gummy with

SAMPLE ANALYSIS- PSY

approximately 5mg Psilocybin and 2mg Psilocin is to be analyzed, the dosage should be set to 5mg. This number is used to get LightLab sample preparation into the correct range, so an exact dosage is not required.

Enter dose per serving

20 Tests Remaining
LL030455

Enter an approximate dose per serving

Dosage 5.0 mg

5. FOR EDIBLE TYPES ONLY: Enter the serving size of the edible. This is the weight or volume of the edible that contains one dose. For example, if a 5mg gummy weighs 2.5g, then 2.5g would be entered here.

Serving Size

20 Tests Remaining
LL030455

Enter a serving size in g

Serving size 2.5 g

6. FOR EDIBLE TYPES ONLY: Enter the number of servings per package. For example, if a package of gummies contains 20 gummies, the number entered here would be 20. If the sample being tested contains only 1 dose, enter 1 for the package size. For example, an infused beverage with a single 5mg dose would require entering 1 for the package size.

SAMPLE ANALYSIS- PSY

Home | Servings Per Package 23 Tests Remaining
H.Ese

Enter the number of servings per package

Package size servings

7. Once the dosage and serving information is entered, information about the sample to be analyzed is entered next. None of the sample information is required, but it is recommended that information is entered so that test data can be tracked more easily. Note at least one of the top two information bars, Product and SKU are required if a preset is to be saved (See section on Saving Presets below).

Home | Enter Sample Information 20 Tests Remaining
LL030455

Product

SKU

Batch

Sample ID

Operator

Notes

After all information is entered, a test summary screen will appear. There are 3 sections displayed:

- The left column gives sample information entered previously.
- The middle column displays information about the dosage, serving size and servings per container entered previously.
- The right column shows information about the analysis. LightLab uses a sophisticated algorithm to determine the sample size, extraction solvent amounts and type of solvent is used for extraction. The information on dosage and sample size as well as the type of edible selected are inputs to this algorithm. The "Sample Size" is the amount of sample that will be required to weigh out for analysis. The "Extraction Type" shows the types of LightLab solvent that will be used for extraction (always LightLab Psy Extraction solvent for psychedelics)

SAMPLE ANALYSIS- PSY

Test Summary

20 Tests Remaining
LL030455

| | | |
|----------------|------------------------|-----------------|
| Sample Type | Dose | Sample Size |
| Gummy | 5.0 mg | 0.500 g |
| Product | Serving Size | Extraction Type |
| Honey Lavender | 2.6 g | Solvent B/A Mix |
| SKU Code | Servings Per Container | Solvent Volume |
| 851601006126 | 20 | 20 ml |
| ID | Gummy 001 | |
| Notes | | |

Save Preset

- The “Save Preset” button will save a preset that allows skipping information on sample and dosage for faster analysis. See the section “Saving Presets” below for more information.
- After the test summary is displayed, selecting the forward arrow will begin the analysis. The specific instructions displayed will depend on the sample type selected. Several steps are common between different sample types and are described below.
- For all samples, LightLab requires a flush before analysis. The flush clears the sample loop before analysis and ensures that no cross contamination occurs when the valve is moved. The flush requires injecting approximately 3ml into the LightLab Sample In port. The valve should not be moved during the injection.

Injector Flush

3 Tests Remaining
LL030455

- Fill clean syringe with at least 3ml solvent
- Attach syringe to Sample In port. DO NOT move valve position
- Inject about 3ml of solvent

- QR Codes are displayed that link to sample preparation instructional videos for some sample types. Capture the QR code with a mobile device to watch videos about sample preparation best practices.
In addition to QR codes, LightLab displays on-screen standard operating procedures that guide sample preparation and analysis. Your samples may require adjustments to these standard operating procedures. Contact Orange

SAMPLE ANALYSIS- PSY

Photonics support if your samples don't conform to any supported products or if assistance is needed with sample preparation or SOPs.

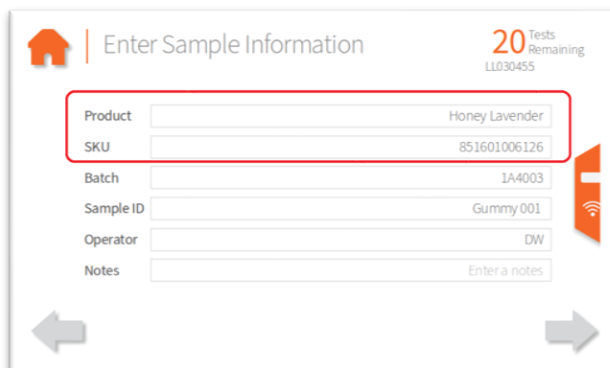


SAVING PRESETS

Presets are saved SOPs that allow faster analysis of samples frequently tested. For example, a preset may be saved for a particular product type or flavor. If a preset is saved, accessing that saved preset will load the sample type, sample name, SKU/barcode, dosage, serving size and servings per container. Saving presets can save time and ensure consistent analysis of products that are tested frequently.

A preset may be saved as follows:

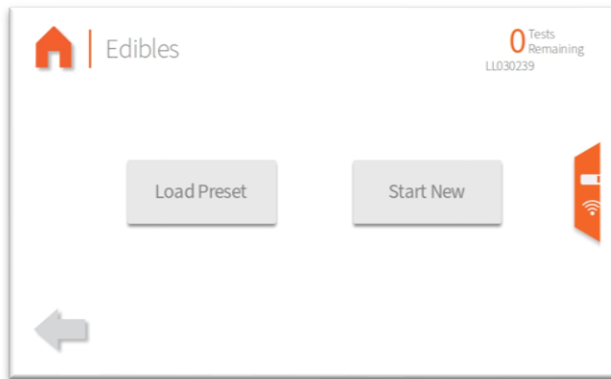
4. Start a new edibles analysis.
5. Enter information about sample types and dosages.
6. When prompted to enter sample information, enter a Product Name and/or SKU. These fields are used to start a preset later. Note if a SKU is saved, LightLab can automatically start a saved preset simply by scanning the SKU.



Once the preset is saved, it can be accessed in two ways:

SAMPLE ANALYSIS- PSY

3. Select "Load Preset" from the edibles menu. A list of saved presets will appear. Presets may be loaded or deleted from this menu.



4. If a SKU or barcode is scanned, LightLab will automatically load a preset. We recommend saving SKUs if your product has them so that a test may be started by simply scanning that SKU.

Once a preset is loaded, the sample information may be entered. Note the Product and SKU will be automatically loaded from the preset. The other fields may be entered to provide information about a particular sample but are not required for analysis.

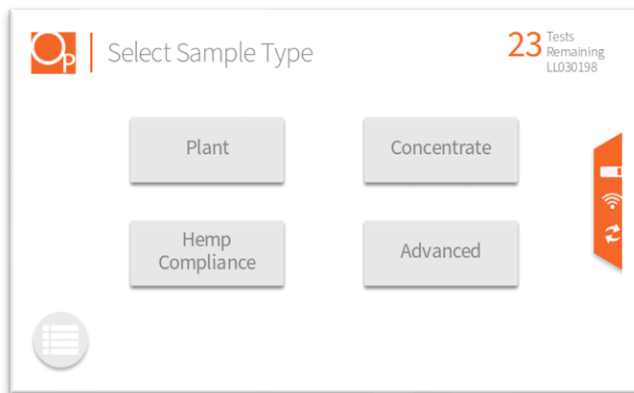
SAMPLE ANALYSIS - PLANT

Sample Analysis- Plant

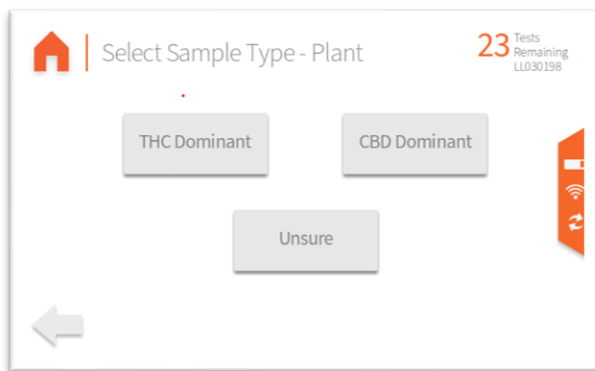
Plant analysis should be used with any dried and cured cannabis flower material. LightLab can analyze wet flower as well, although we recommend drying any sample prior to analysis since this results in the highest accuracy. See Appendix 1 for more information on sample drying. If wet samples are run, we recommend using “Young Plant” mode, and results should be considered qualitative.

NOTE: Plants that are not yet in the flowering stage should be run in “Young Plant” mode.

1. Select the type of sample to be measured (Plant for this section).



2. Select the cultivar type of the sample to be measured. If you are unsure, press “Unsure.”



SAMPLE ANALYSIS - PLANT

3. Add sample tags to the sample record if desired. Sample tags are free form text fields for storing information about the sample. They will be saved along with the sample results and can be accessed later.

Enter tags for this sample

23 Tests Remaining
LL030198

Sample ID

Cultivar

Notes

Operator

4. [FOR HS UNITS ONLY, NOT REQUIRED FOR STANDARD LIGHTLAB 3] LightLab 3 HS requires a flush before analysis. The flush clears the sample loop before analysis and ensures that no cross contamination occurs when the valve is moved. The flush requires injecting approximately 3ml into the LightLab Sample In port. The valve should not be moved during the injection.

Injector Flush

3 Tests Remaining
LL030455

Fill clean syringe with at least 3ml solvent

Attach syringe to Sample In port. DO NOT move valve position

Inject about 3ml of solvent

5. If Moisture Correction is enabled, enter the moisture content of the sample to be run. If the moisture is not known, you do not want to correct for moisture, or you wish to replicate a lab's "As-Received" data, enter 0 to continue.

SAMPLE ANALYSIS - PLANT

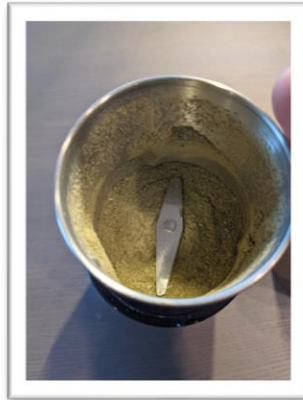
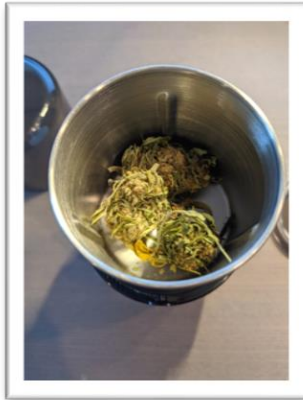
Home | Moisture Content 23 Tests Remaining
LLO30198

1 2 3 Enter a value between
4 5 6 0.0% and 20.0%

7 8 9 Value %

0 . DEL

6. Prepare at least 1g of sample with the included electric grinder. Older LightLabs may have a hand grinder. See “LightLab Electric Grinder Instructions” section for full grinder instructions. Press forward arrow on the LightLab screen.



SAMPLE ANALYSIS - PLANT

7. Place scale on level surface and turn on.



8. Check calibration of scale by placing 10g calibration weight on scale. Results should be between 9.997 and 10.003. If not proceed to Section 11 to recalibrate scale.



SAMPLE ANALYSIS - PLANT

9. Place a vial on the scale and press “tare”. Ensure scale now reads zero with the vial resting on it. Press forward arrow on the LightLab screen.



10. If the cultivar type selected was THC dominant or Unknown, add 0.300g (+/- 0.030g) of sample to the scale. If the cultivar type selected was CBD dominant, add 0.200g (+/- 0.020g). Press the forward arrow on the screen.



SAMPLE ANALYSIS - PLANT

11. Type in the exact sample reading on the scale. Press the forward arrow on the screen.



12. Add **30ml** of solvent by following the steps below 3 times:

- a. Connect the syringe to the solvent cap and pull plunger up to fill syringe. Fill syringe with at least 10ml of solvent.



SAMPLE ANALYSIS - PLANT

- b. Invert the syringe so that the bubble floats to the tip. Depress the plunger to remove the air bubbles and get the syringe volume to exactly 10ml. A tissue may be used to catch any excess solvent.

NOTE: It is important to ensure the syringe has exactly 10ml of solvent for accurate results.



- c. Add contents of syringe to vial.



13. Place cap firmly on vial. Press forward arrow on LightLab screen.

SAMPLE ANALYSIS - PLANT

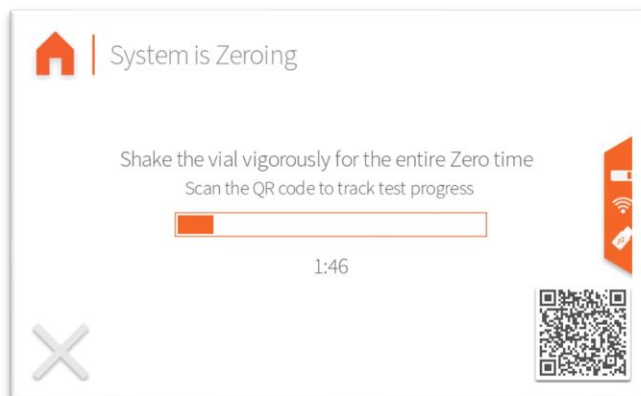
14. Place vial into shaker and strap in place, then turn on shaker. Press forward arrow on LightLab screen.



15. Ensure the valve is set to R. Press forward arrow on LightLab screen.

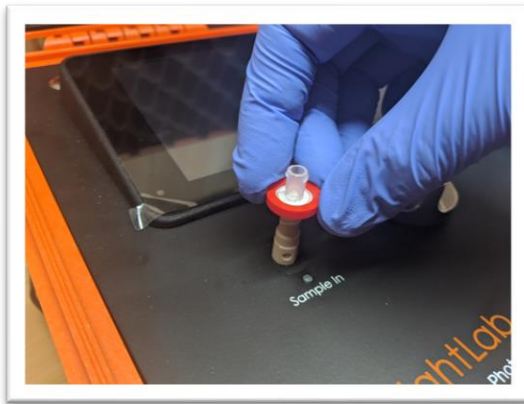


16. Press the "Start" button. The zero process will begin, and a shaker timer will appear. Note in some cases LightLab will determine that more time is required to ensure a successful sample run. LightLab will beep and indicate that the shaker should be stopped while the system finishes up zeroing.



17. Once Zero is complete, add syringe filter onto sample port. Press forward arrow on screen.

SAMPLE ANALYSIS - PLANT



18. Set valve to L. Press forward arrow on screen.



19. Remove cap from vial and pull at least 4 ml of sample into syringe used previously. The exact amount of sample isn't important. Press forward arrow on screen.



20. Place syringe on syringe filter at sample port by gently twisting it on about a quarter turn. Press forward arrow on screen.

SAMPLE ANALYSIS - PLANT



21. Slowly inject at least 3ml of sample into sample port. The exact amount isn't important. There will be some resistance when injecting a sample- this is normal. Press forward arrow on screen.

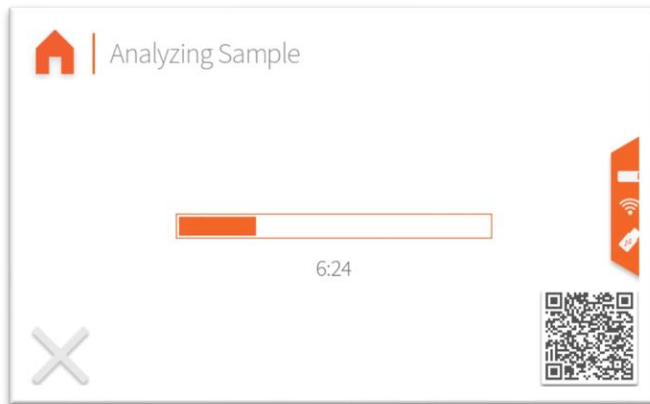


22. Set valve to R. Press forward arrow on screen.

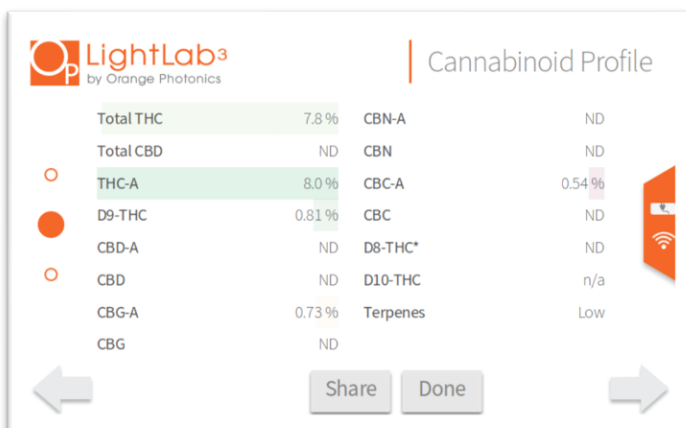
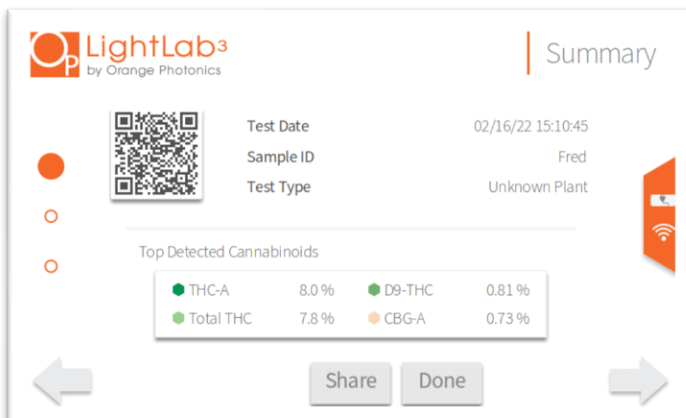


23. Press Start. LightLab will begin to analyze the sample. Results will be ready in 8 minutes and 30 seconds.

SAMPLE ANALYSIS - PLANT



24. Once sampling is complete, results are displayed on the screen. If a USB drive is connected, results will be added to a comma separated value (Excel compatible) file. If internet is connected, capturing the QR code will direct your mobile device to the Mobile Monitoring results page. Pressing the “Share” button will share results to a mobile phone or email. Do not reuse syringe, filter or vial for future tests unless re-running the same sample.



SAMPLE ANALYSIS - PLANT

The interface displays the following data:

| Field | Value | Field | Value |
|---------------|-------------------|-------------|---------------|
| Date | 02/16/22 15:10:45 | Test Type | Unknown Plant |
| Serial Number | LL030001 | Moisture | 0.0% |
| LightLab | Hugh's Dev Unit | Weight | 0.316 g |
| Operator | | Solvent | 30 ml |
| Sample ID | Fred | Temperature | 0.3 C |
| Method | LightLab HPLC | Cultivar | |
| Notes | | | |

Navigation and UI elements include a back arrow, 'Share' and 'Done' buttons, and a right arrow. A vertical bar on the right side of the screen contains a Wi-Fi icon and a signal strength indicator.

SAMPLE ANALYSIS- CONCENTRATES

Sample Analysis- Concentrates

Concentrates setting should be used for any extracted cannabis material including CO₂, ethanol and butane extracts, distillates, and other concentrated cannabis extracts. For concentrates, LightLab uses a two-part solvent system. The first solvent allows for good extraction of most concentrates, and the second solvent both prepares the sample chemistry for analysis as well as crashes out any lipids, waxes or oils present in the sample.

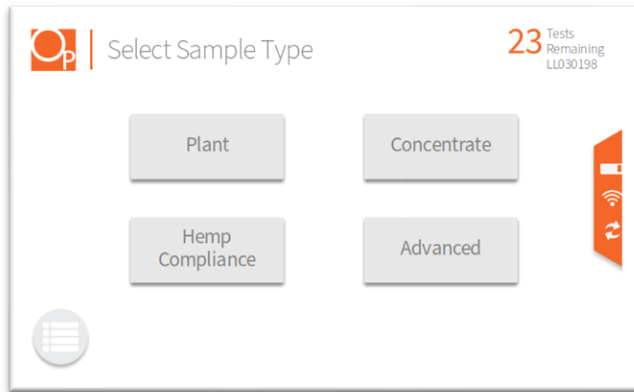
1. Place fluidics caps on solvent A and solvent B bottles.

NOTE: Do not leave the fluidics caps on the solvent bottles for storage. Doing so will allow the solvent to evaporate and make extraction difficult. When storing the solvent, replace the fluidics caps with the storage caps that do not have a syringe connector on them.

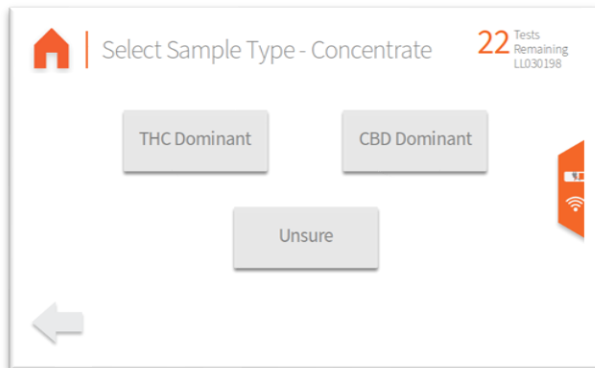


SAMPLE ANALYSIS- CONCENTRATES

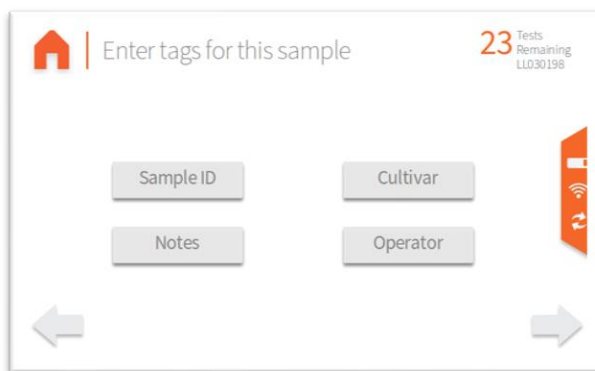
2. Select the type of sample to be measured (concentrate for this section).



3. Select the type of sample to be measured. If you are unsure, press "Unsure."

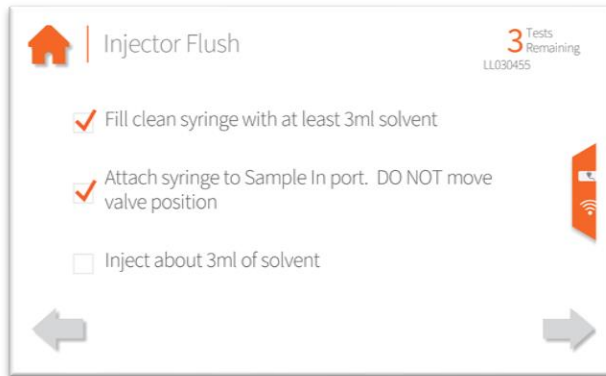


4. Add sample tags to the sample record if desired. Sample tags are free form text fields for storing information about the sample. They will be saved along with the sample results and can be accessed later.



SAMPLE ANALYSIS- CONCENTRATES

5. [FOR HS UNITS ONLY, NOT REQUIRED FOR STANDARD LIGHTLAB 3] LightLab 3 HS requires a flush before analysis. The flush clears the sample loop before analysis and ensures that no cross contamination occurs when the valve is moved. The flush requires injecting approximately 3ml into the LightLab Sample In port. The valve should not be moved during the injection.



6. Gather at least 0.1 g of sample. Most samples do not need any specific preparation; however, this may vary depending on the sample type.



7. Place scale on level surface and turn on.



SAMPLE ANALYSIS- CONCENTRATES

8. Check calibration of scale by placing 10g calibration weight on scale. Results should be between 9.997 and 10.003. If not proceed to Section 11 to recalibrate scale.



9. Place a vial on the scale and press "tare". Ensure scale now reads zero with the vial resting on it. Press forward arrow on the LightLab screen.



SAMPLE ANALYSIS- CONCENTRATES

10. If THC Dominant sample type was selected, add 0.1g (+/- 0.010g) to the vial by pouring sample into the vial or smearing the sample on the side of the vial. If CBD Dominant sample type was selected, add 0.070g (+/-0.007g). Press forward arrow on the screen.



11. Type in the exact sample reading on the scale. Press forward arrow on the screen.



SAMPLE ANALYSIS- CONCENTRATES

12. Add **20ml of Solvent A** to the vial by following the steps below twice:
 - a. Connect the syringe to the fluidics cap on **Solvent A** and pull up plunger to fill syringe. Fill syringe with at least 10ml of solvent.



SAMPLE ANALYSIS- CONCENTRATES

- b. Invert the syringe so that the bubble floats to the tip. Depress the plunger to remove the air bubbles and get the syringe volume to exactly 10ml. A tissue may be used to catch any excess solvent.

NOTE: It is important to ensure the syringe has exactly 10ml of solvent for accurate results.



- c. Add contents of syringe to vial.



SAMPLE ANALYSIS- CONCENTRATES

13. Place cap firmly on vial. Press forward arrow on LightLab screen.
14. (optional) Place the extraction vial into the sample heater, then fill the included measuring cup with water and pour contents into the heater. Most samples will be heated sufficiently by filling measuring cup to the "E" line. Press firmly down on the orange button near the bottom of the heater to start heating.
NOTE: this step may be optional and may be skipped if the sample readily extracts in Solvent A. Distillates and winterized oils typically don't need heat, crude or un-winterized oils typically need heat.



15. The heater will boil water and make steam which causes the contents of the sample vial to warm up. Heating takes approximately 2 minutes.

SAMPLE ANALYSIS- CONCENTRATES

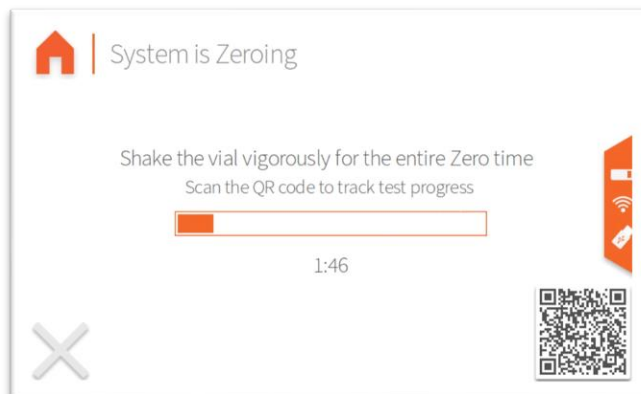
16. Once the orange light on the heater turns off and all water in the heater has boiled away, remove vial carefully (it may be hot!) and place vial into shaker and strap in place. Turn on the shaker. Press forward arrow on screen. NOTE: For best results place sample into shaker immediately after heating is complete. If the sample cools off the extraction may be poor.



17. Ensure the valve is set to RUN. Press forward arrow on LightLab screen.



18. Press the "Start" button. The zero process will begin, and a shaker timer will appear. Note in some cases LightLab will determine that more time is required to ensure a successful sample run. LightLab will beep and indicate that the shaker should be stopped while the system finishes up zeroing.

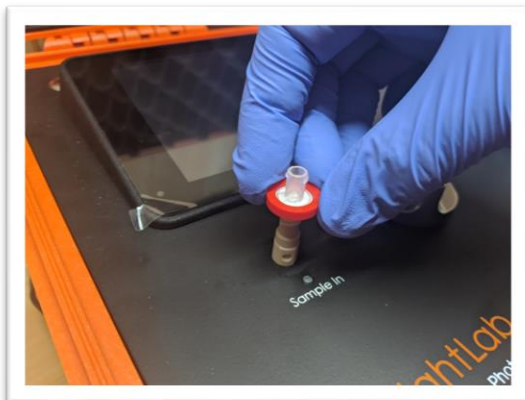


SAMPLE ANALYSIS- CONCENTRATES

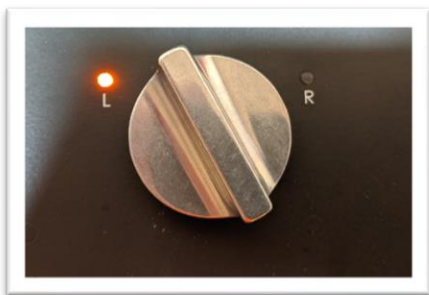
19. Once zero is complete, remove vial from shaker and add **10ml of Solvent B**. Give the vial a quick hand shake to ensure the solvent is mixed.



20. Add syringe filter onto sample port. Press forward arrow on screen.



21. Set valve to L. Press forward arrow on screen.



SAMPLE ANALYSIS- CONCENTRATES

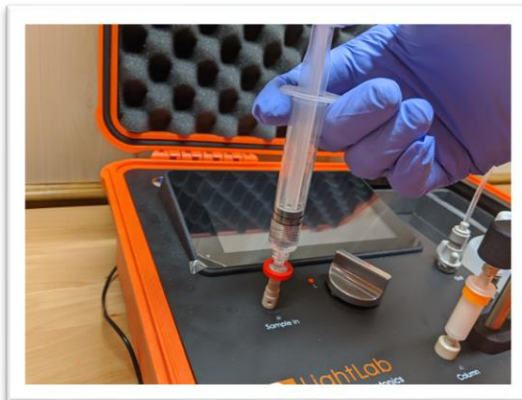
22. Remove cap from vial and pull at least 4 ml of sample into syringe used previously. The exact amount of sample isn't important. Press forward arrow on screen.



23. Place syringe on syringe filter at sample port by gently twisting it on about a quarter turn. Press forward arrow on screen.



24. Slowly inject at least 3ml of sample into sample port. The exact amount isn't important. There will be some resistance when injecting a sample- this is normal. Press forward arrow on screen.

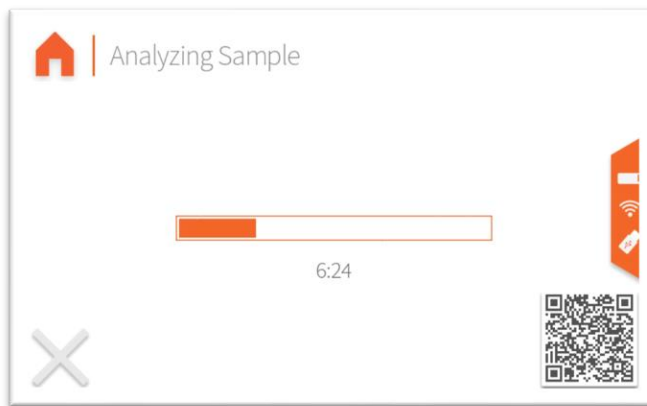


SAMPLE ANALYSIS- CONCENTRATES

25. Set valve to R. Press forward arrow on screen.



26. Press Start. LightLab will begin to analyze the sample. Results will be ready in 8 minutes and 30 seconds.




27. Once sampling is complete, results are displayed on the screen. If a USB drive is connected, results will be added to a comma separated value (Excel compatible) file. If internet is connected, capturing the QR code will direct your mobile device to the Mobile Monitoring results page. Pressing the “Share” button will share results to a mobile phone or email. Do not reuse syringe, filter or vial for future tests unless re-running the same sample.

SAMPLE ANALYSIS- CONCENTRATES

LightLab³
by Orange Photonics

Summary


 Test Date: 02/16/22 15:10:45
 Sample ID: Fred
 Test Type: Unknown Plant

Top Detected Cannabinoids

| | | | |
|-----------|-------|--------|--------|
| THC-A | 8.0 % | D9-THC | 0.81 % |
| Total THC | 7.8 % | CBG-A | 0.73 % |

Share Done

LightLab³
by Orange Photonics

Cannabinoid Profile

| | | | |
|-----------|--------|----------|--------|
| Total THC | 7.8 % | CBN-A | ND |
| Total CBD | ND | CBN | ND |
| THC-A | 8.0 % | CBC-A | 0.54 % |
| D9-THC | 0.81 % | CBC | ND |
| CBD-A | ND | D8-THC* | ND |
| CBD | ND | D10-THC | n/a |
| CBG-A | 0.73 % | Terpenes | Low |
| CBG | ND | | |

Share Done

LightLab³
by Orange Photonics

Details

| | | | |
|---------------|-------------------|-------------|---------------|
| Date | 02/16/22 15:10:45 | Test Type | Unknown Plant |
| Serial Number | LL030001 | Moisture | 0.0% |
| LightLab | Hugh's Dev Unit | Weight | 0.316 g |
| Operator | | Solvent | 30 ml |
| Sample ID | Fred | Temperature | 0.3 C |
| Method | LightLab HPLC | Cultivar | |
| Notes | | | |

Share Done

SAMPLE ANALYSIS- CONCENTRATES

28. If no further tests are going to be completed, remove the fluidics caps on the concentrate extract solvent bottles and replace them with the storage caps. The storage caps do not have syringe connections on them.



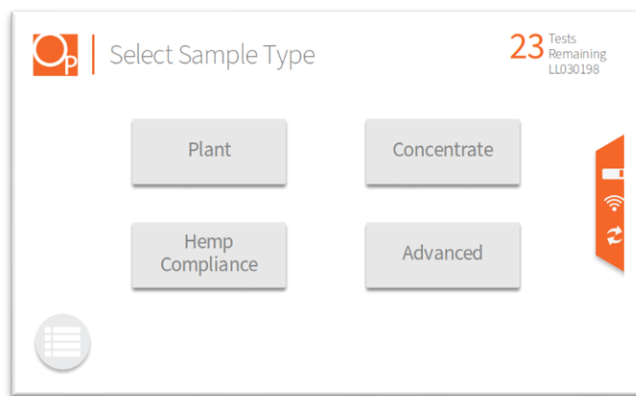
SAMPLE ANALYSIS- YOUNG PLANT

Sample Analysis- Young Plant

Young Plant analysis should be used for any cannabis plant before flowering has begun. Orange Photonics recommends drying wet samples if possible before analysis for quantitative results. See Appendix 1 for drying suggestions.

NOTE: Young Plant is an advanced analysis that may require modifications to the procedure below depending on the data/reporting required. It is not recommended for novice LightLab users.

1. Select “Advanced” as the sample type for the main screen.

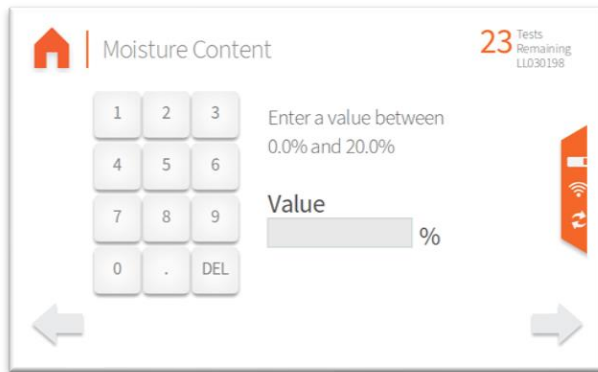


2. Select the type of sample to be measured from the new list that appears (Young Plant for this section).



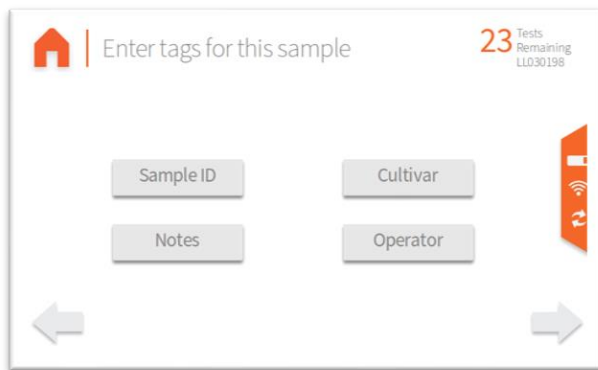
3. If moisture correction is enabled, enter the moisture content of the sample to be run. For THC/CBD ratio testing, we recommend entering 0 and not drying the plant. For quantitative analysis, we recommend either analyzing the moisture content using a gravimetric moisture meter or drying the sample to 0% moisture. See Appendix 1 for drying recommendations.

SAMPLE ANALYSIS- YOUNG PLANT



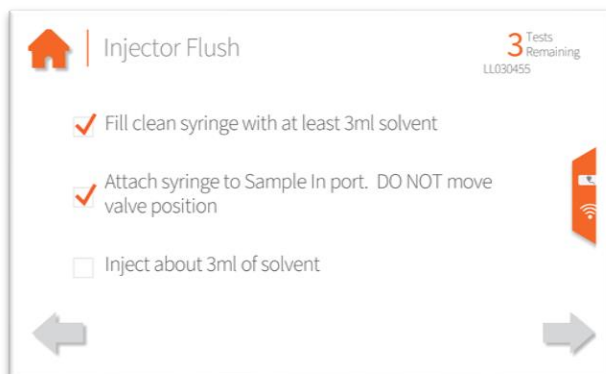
The screenshot shows a mobile application interface for entering moisture content. At the top left is a home icon and the text 'Moisture Content'. At the top right, it says '23 Tests Remaining LL030198'. Below the title is a numeric keypad with buttons for digits 1-9, 0, a decimal point, and a 'DEL' key. To the right of the keypad, the text reads 'Enter a value between 0.0% and 20.0%'. Below this is a label 'Value' followed by a text input field and a '%' symbol. On the right side of the screen, there is a vertical orange bar with a home icon, a signal strength indicator, and a refresh icon. At the bottom, there are left and right navigation arrows.

29. Add sample tags to the sample record if desired. Sample tags are free form text fields for storing information about the sample. They will be saved along with the sample results and can be accessed later.



The screenshot shows a mobile application interface for entering sample tags. At the top left is a home icon and the text 'Enter tags for this sample'. At the top right, it says '23 Tests Remaining LL030198'. Below the title are four text input fields arranged in a 2x2 grid: 'Sample ID', 'Cultivar', 'Notes', and 'Operator'. On the right side of the screen, there is a vertical orange bar with a home icon, a signal strength indicator, and a refresh icon. At the bottom, there are left and right navigation arrows.

30. [FOR HS UNITS ONLY, NOT REQUIRED FOR STANDARD LIGHTLAB 3] LightLab 3 HS requires a flush before analysis. The flush clears the sample loop before analysis and ensures that no cross contamination occurs when the valve is moved. The flush requires injecting approximately 3ml into the LightLab Sample In port. The valve should not be moved during the injection.



The screenshot shows a mobile application interface for the injector flush procedure. At the top left is a home icon and the text 'Injector Flush'. At the top right, it says '3 Tests Remaining LL030455'. Below the title is a checklist with three items: 'Fill clean syringe with at least 3ml solvent' (checked), 'Attach syringe to Sample In port. DO NOT move valve position' (checked), and 'Inject about 3ml of solvent' (unchecked). On the right side of the screen, there is a vertical orange bar with a home icon, a signal strength indicator, and a refresh icon. At the bottom, there are left and right navigation arrows.

SAMPLE ANALYSIS- YOUNG PLANT

4. Gather about 1g of sample from the plant. Note the cannabinoid content may be significantly different from a leaf sample when compared to a flower. We recommend gathering flower parts for flowering plants and large healthy leaves for vegetative plants.
5. Place scale on level surface and turn on.



6. Check calibration of scale by placing 10g calibration weight on scale. Results should be between 9.997 and 10.003. If not proceed to Section 11 to recalibrate scale.



7. Place a vial on the scale and press “tare”. Ensure scale now reads zero with the vial resting on it. Press forward arrow on the LightLab screen.

SAMPLE ANALYSIS- YOUNG PLANT



8. Chop or cut the plant material into pieces, then add the amount of sample indicated by LightLab (0.500 +/- 0.05g) to the vial.



SAMPLE ANALYSIS- YOUNG PLANT

9. Type in the exact sample reading on the scale. Press forward arrow on the LightLab screen.



10. Connect the syringe to the solvent cap and pull plunger up to fill syringe. Fill syringe with at least 10ml of solvent.



11. Invert the syringe so that the bubble floats to the tip. Depress the plunger to remove the air bubbles and get the syringe volume to exactly 10ml. A tissue may be used to catch any excess solvent.

NOTE: It is important to ensure the syringe has exactly 10ml of solvent for accurate results.

SAMPLE ANALYSIS- YOUNG PLANT



12. Add contents of syringe to vial.



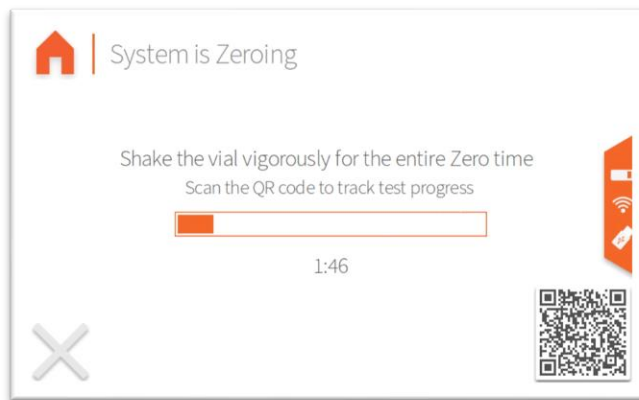
13. Place cap firmly on vial. Press forward arrow on LightLab screen.

14. Ensure the valve is set to R. Press forward arrow on LightLab screen.

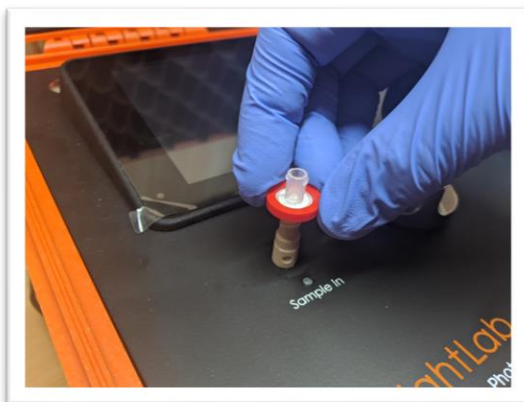
SAMPLE ANALYSIS- YOUNG PLANT



15. Press the “Start” button. The zero process will begin, and a shaker timer will appear. Note in some cases LightLab will determine that more time is required to ensure a successful sample run. LightLab will beep and indicate that the shaker should be stopped while the system finishes up zeroing.



16. Once Zero is complete, add syringe filter onto sample port. Press forward arrow on screen.



SAMPLE ANALYSIS- YOUNG PLANT

17. Set valve to L. Press forward arrow on screen.



18. Remove cap from vial and pull at least 4 ml of sample into syringe used previously. The exact amount of sample isn't important. Press forward arrow on screen.

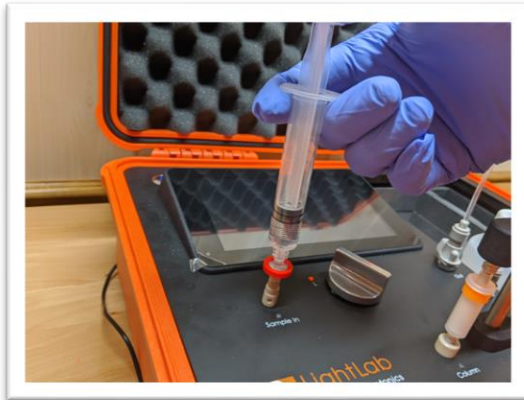


19. Place syringe on syringe filter at sample port by gently twisting it on about a quarter turn. Press forward arrow on screen.



SAMPLE ANALYSIS- YOUNG PLANT

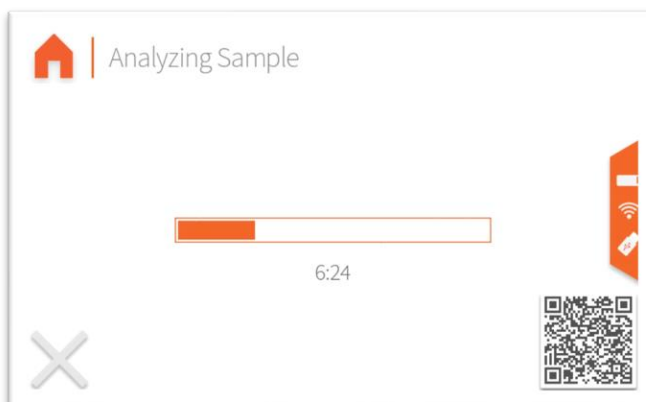
20. Slowly inject at least 3ml of sample into sample port. The exact amount isn't important. There will be some resistance when injecting a sample- this is normal. Press forward arrow on screen.



21. Set valve to R. Press forward arrow on screen.



22. Press Start. LightLab will begin to analyze the sample. Results will be ready in 8 minutes and 30 seconds.



23. Once sampling is complete, results are displayed on the screen. If a USB drive is connected, results will be added to a comma separated value (Excel compatible) file. If internet is connected, capturing the QR code will direct your mobile

SAMPLE ANALYSIS- YOUNG PLANT

device to the Mobile Monitoring results page. Pressing the “Share” button will share results to a mobile phone or email. Do not reuse syringe, filter or vial for future tests unless re-running the same sample.

LightLab³
by Orange Photonics

Summary

Test Date: 02/16/22 15:10:45
 Sample ID: Fred
 Test Type: Unknown Plant

Top Detected Cannabinoids

| | | | |
|-----------|-------|--------|--------|
| THC-A | 8.0 % | D9-THC | 0.81 % |
| Total THC | 7.8 % | CBG-A | 0.73 % |

Share Done

LightLab³
by Orange Photonics

Cannabinoid Profile

| | | | |
|-----------|--------|----------|--------|
| Total THC | 7.8 % | CBN-A | ND |
| Total CBD | ND | CBN | ND |
| THC-A | 8.0 % | CBC-A | 0.54 % |
| D9-THC | 0.81 % | CBC | ND |
| CBD-A | ND | D8-THC* | ND |
| CBD | ND | D10-THC | n/a |
| CBG-A | 0.73 % | Terpenes | Low |
| CBG | ND | | |

Share Done

LightLab³
by Orange Photonics

Details

| | | | |
|---------------|-------------------|-------------|---------------|
| Date | 02/16/22 15:10:45 | Test Type | Unknown Plant |
| Serial Number | LL030001 | Moisture | 0.0% |
| LightLab | Hugh's Dev Unit | Weight | 0.316 g |
| Operator | | Solvent | 30 ml |
| Sample ID | Fred | Temperature | 0.3 C |
| Method | LightLab HPLC | Cultivar | |
| Notes | | | |

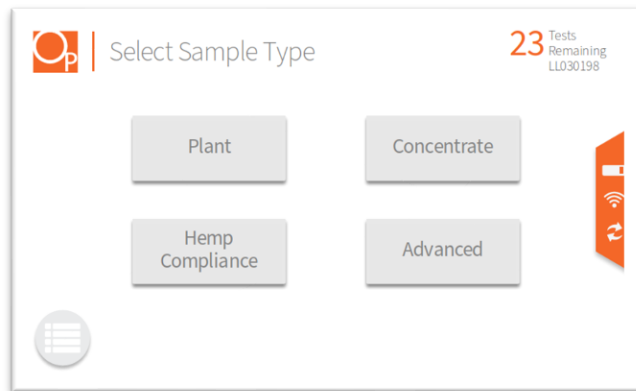
Share Done

SAMPLE ANALYSIS- RAFFINATE

Sample Analysis- Raffinate

Raffinate analysis should be used for plant material which has previously been extracted using CO₂, Butane, Ethanol, etc. Raffinate is typically tested to ensure extraction was run to completion. The addition of 600mg rather than the 300mg used for Flower analysis allows a detection limit of 0.25% (flower has a detection limit of 0.5%)

1. Select "Advanced" as the sample type for the main screen.



2. Select the type of sample to be measured from the new list that appears (Raffinate for this section).



SAMPLE ANALYSIS- RAFFINATE

3. If Moisture Correction is enabled, enter the moisture content of the sample to be run. If the moisture is not known, enter 0 to continue.

Moisture Content

23 Tests Remaining
LL030198

Enter a value between 0.0% and 20.0%

Value %

4. Add sample tags to the sample record if desired. Sample tags are free form text fields for storing information about the sample. They will be saved along with the sample results and can be accessed later.

Enter tags for this sample

23 Tests Remaining
LL030198

Sample ID

Cultivar

Notes

Operator

5. [FOR HS UNITS ONLY, NOT REQUIRED FOR STANDARD LIGHTLAB 3] LightLab 3 HS requires a flush before analysis. The flush clears the sample loop before analysis and ensures that no cross contamination occurs when the valve is moved. The flush requires injecting approximately 3ml into the LightLab Sample In port. The valve should not be moved during the injection.

Injector Flush

3 Tests Remaining
LL030455

Fill clean syringe with at least 3ml solvent

Attach syringe to Sample In port. DO NOT move valve position

Inject about 3ml of solvent

SAMPLE ANALYSIS- RAFFINATE

6. Gather at least 2g of raffinate and grind if required with the included electric grinder. Older LightLabs may have a hand grinder. See “LightLab Electric Grinder Instructions” section for full grinder instructions. Note gathering and analyzing multiple samples from different locations within the extraction vessel may help to determine whether any channeling or poor extraction is occurring. Channeling, poor packing of an extraction vessel or other issues may result in significant variation in cannabinoid content within the raffinate material.



7. Place scale on level surface and turn on.



SAMPLE ANALYSIS- RAFFINATE

8. Check calibration of scale by placing 10g calibration weight on scale. Results should be between 9.997 and 10.003. If not proceed to Section 11 to recalibrate scale.



9. Place a vial on the scale and press "tare". Ensure scale now reads zero with the vial resting on it. Press forward arrow on the LightLab screen.

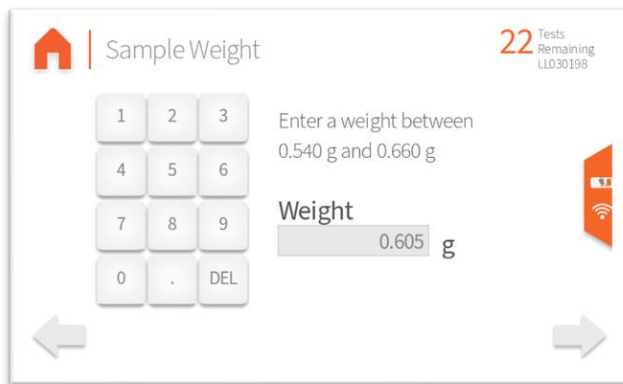


SAMPLE ANALYSIS- RAFFINATE

10. Add 0.6 g (+/-0.060g) to the scale. Press forward arrow on the screen.



11. Type in the exact sample reading on the scale. 0.540-0.660g is an acceptable range. Press forward arrow on the screen. Press forward arrow on the LightLab screen.



SAMPLE ANALYSIS- RAFFINATE

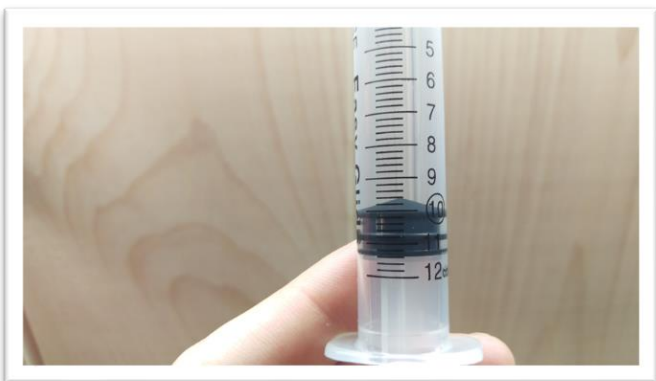
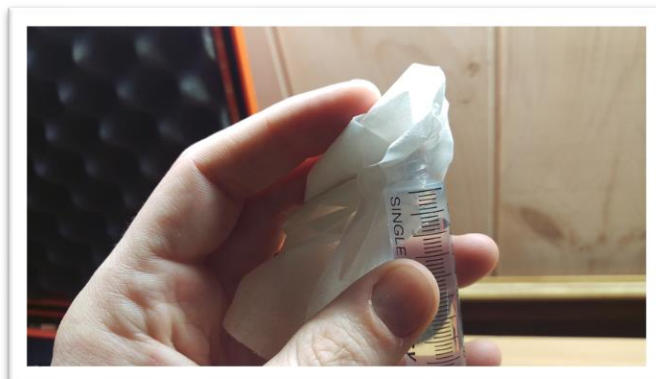
12. Add **30ml** of solvent by following the steps below 3 times:

- a. Connect the syringe to the solvent cap and pull plunger up to fill syringe. Fill syringe with at least 10ml of solvent.



- b. Invert the syringe so that the bubble floats to the tip. Depress the plunger to remove the air bubbles and get the syringe volume to exactly 10ml. A tissue may be used to catch any excess solvent.

NOTE: It is important to ensure the syringe has exactly 10ml of solvent for accurate results.

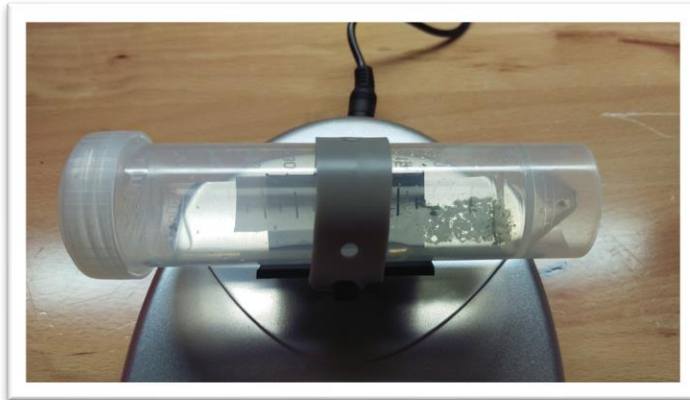


SAMPLE ANALYSIS- RAFFINATE

- c. Add contents of syringe to vial.



13. Place cap firmly on vial. Press forward arrow on LightLab screen.
14. Place vial into shaker and strap in place, then turn on shaker. Press forward arrow on LightLab screen.

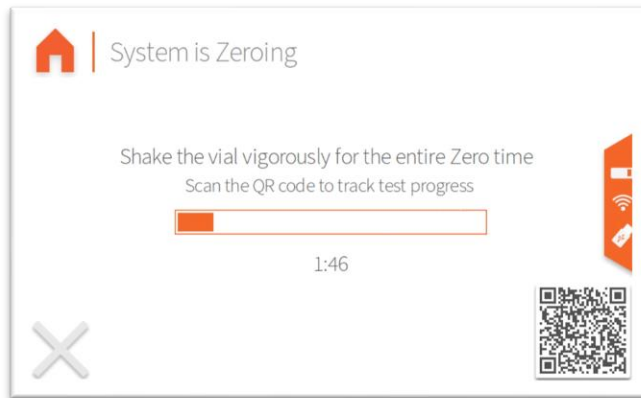


15. Ensure the valve is set to R. Press forward arrow on LightLab screen.

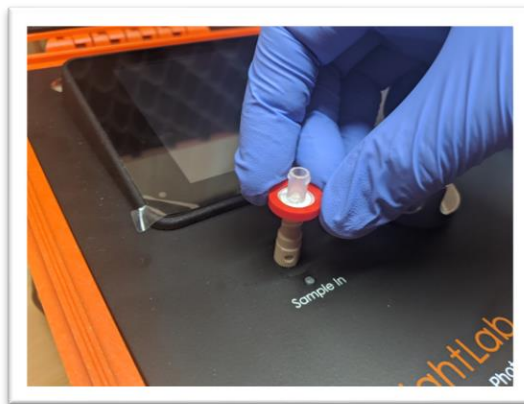


16. Press the "Start" button. The zero process will begin, and a shaker timer will appear. Note in some cases LightLab will determine that more time is required to ensure a successful sample run. LightLab will beep and indicate that the shaker should be stopped while the system finishes up zeroing.

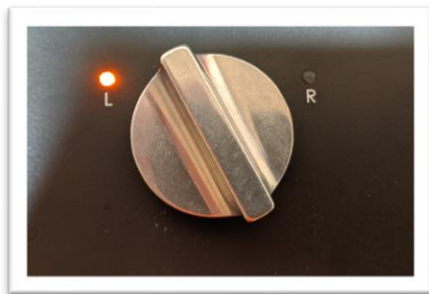
SAMPLE ANALYSIS- RAFFINATE



17. Once Zero is complete, add syringe filter onto sample port. Press forward arrow on screen.



18. Set valve to L. Press forward arrow on screen.



SAMPLE ANALYSIS- RAFFINATE

19. Remove cap from vial and pull at least 4 ml of sample into syringe used previously. The exact amount of sample isn't important. Press forward arrow on screen.



20. Place syringe on syringe filter at sample port by gently twisting it on about a quarter turn. Press forward arrow on screen.



21. Slowly inject at least 3ml of sample into sample port. The exact amount isn't important. There will be some resistance when injecting a sample- this is normal. Press forward arrow on screen.

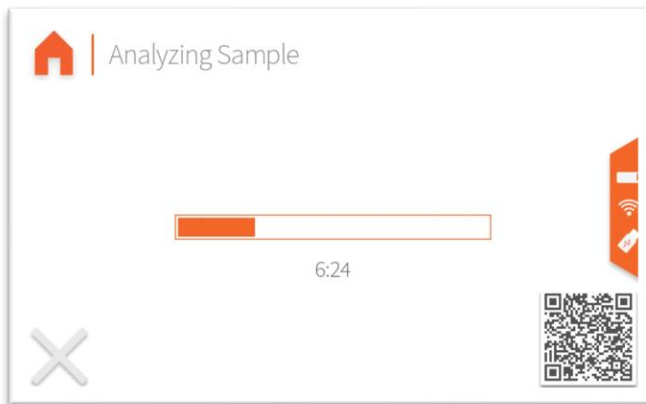


SAMPLE ANALYSIS- RAFFINATE

22. Set valve to R. Press forward arrow on screen.



23. Press Start. LightLab will begin to analyze the sample. Results will be ready in 8 minutes and 30 seconds.




24. Once sampling is complete, results are displayed on the screen. If a USB drive is connected, results will be added to a comma separated value (Excel compatible) file. If internet is connected, capturing the QR code will direct your mobile device to the Mobile Monitoring results page. Pressing the "Share" button will share results to a mobile phone or email. Do not reuse syringe, filter or vial for future tests unless re-running the same sample.

SAMPLE ANALYSIS- RAFFINATE

LightLab³
by Orange Photonics

Summary


 Test Date: 02/16/22 15:10:45
 Sample ID: Fred
 Test Type: Unknown Plant

Top Detected Cannabinoids

| | | | |
|-----------|-------|--------|--------|
| THC-A | 8.0 % | D9-THC | 0.81 % |
| Total THC | 7.8 % | CBG-A | 0.73 % |

Share Done

LightLab³
by Orange Photonics

Cannabinoid Profile

| | | | |
|-----------|--------|----------|--------|
| Total THC | 7.8 % | CBN-A | ND |
| Total CBD | ND | CBN | ND |
| THC-A | 8.0 % | CBC-A | 0.54 % |
| D9-THC | 0.81 % | CBC | ND |
| CBD-A | ND | D8-THC* | ND |
| CBD | ND | D10-THC | n/a |
| CBG-A | 0.73 % | Terpenes | Low |
| CBG | ND | | |

Share Done

LightLab³
by Orange Photonics

Details

| | | | |
|---------------|-------------------|-------------|---------------|
| Date | 02/16/22 15:10:45 | Test Type | Unknown Plant |
| Serial Number | LL030001 | Moisture | 0.0% |
| LightLab | Hugh's Dev Unit | Weight | 0.316 g |
| Operator | | Solvent | 30 ml |
| Sample ID | Fred | Temperature | 0.3 C |
| Method | LightLab HPLC | Cultivar | |
| Notes | | | |

Share Done

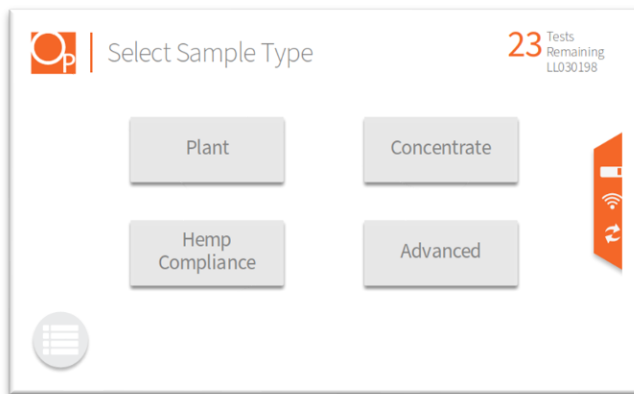
SAMPLE ANALYSIS- TINCTURE

Sample Analysis- Tinctures

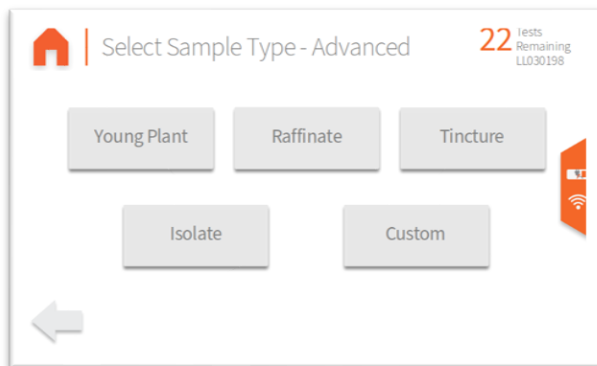
Infused product should be selected when analyzing products infused with cannabis, for example tinctures or edibles. Infused products may require specialized sample preparation techniques. Infused product setting reports samples in mg/g, weight percent or mg/ml to facilitate easy conversion to dosage. For example, a sample that reads 2mg/g and has a weight of 5g would have a total dose of 10mg ($2\text{mg/g} \times 5\text{g}$). We recommend validating any sample preparation and analysis before routine analysis. Some samples may not be possible to measure with a standard LightLab analyzer or may require customized sample preparation. Contact Orange Photonics support if assistance is required.

NOTE: Infused Product is an advanced analysis that may require modifications to the procedure below depending on the data/reporting required. It is not recommended for novice LightLab users.

1. Select “Advanced” as the sample type from the main screen.

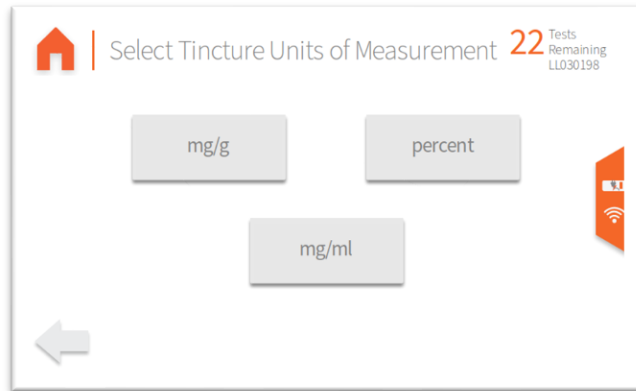


2. Select the type of sample to be measured from the new list that appears (Tincture for this section).

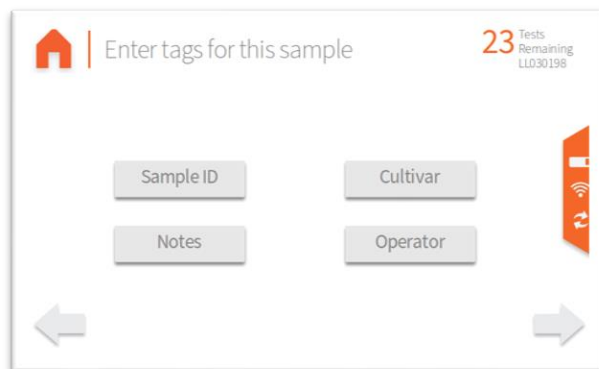


SAMPLE ANALYSIS- TINCTURE

3. Select the units of measurement the results should be returned in. mg/g and percent are both determined based on weight, whereas mg/ml is determined based on volume. Typically weight measurement is more accurate since errors in volume measurement aren't corrected. We therefore recommend mg/g if you are unsure of what to select.

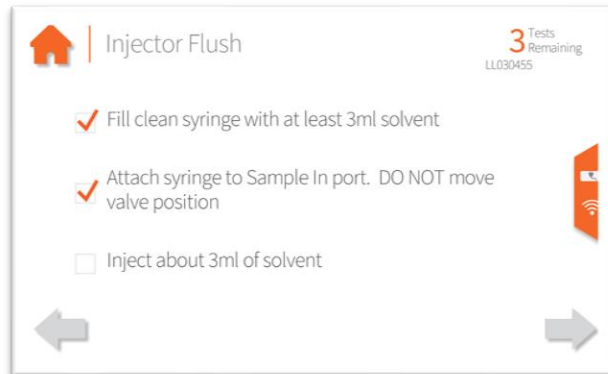


4. Add sample tags to the sample record if desired. Sample tags are free form text fields for storing information about the sample. They will be saved along with the sample results and can be accessed later.



SAMPLE ANALYSIS- TINCTURE

5. [FOR HS UNITS ONLY, NOT REQUIRED FOR STANDARD LIGHTLAB 3] LightLab 3 HS requires a flush before analysis. The flush clears the sample loop before analysis and ensures that no cross contamination occurs when the valve is moved. The flush requires injecting approximately 3ml into the LightLab Sample In port. The valve should not be moved during the injection.



6. Gather a representative sample to be analyzed. The minimum amount of sample required is 0.3g/0.3ml depending on options selected.
7. Place scale on level surface and turn on. NOTE: If mg/ml was selected, LightLab will ask for a volume only. No weighing is required for mg/ml measurement. Skip to step 12 for mg/ml measurement.



SAMPLE ANALYSIS- TINCTURE

8. Check calibration of scale by placing 10g calibration weight on scale. Results should be between 9.997 and 10.003. If not proceed to Section 11 to recalibrate scale.



9. Place a vial on the scale and press "tare". Ensure scale now reads zero with the vial resting on it. Press forward arrow on the LightLab screen.



SAMPLE ANALYSIS- TINCTURE

10. Add the amount of sample required for analysis to the vial. The amount required will be suggested by LightLab depending on options selected. If a User Defined Range is selected, any weight may be used.



11. Type in the exact sample reading on the scale. Press forward arrow on the screen.



SAMPLE ANALYSIS- TINCTURE

12. Connect the syringe to the solvent cap and pull plunger up to fill syringe. Fill syringe with at least 10ml of solvent.



13. Invert the syringe so that the bubble floats to the tip. Depress the plunger to remove the air bubbles and get the syringe volume to the required volume. A tissue may be used to catch any excess solvent.

NOTE: It is important to ensure the syringe has exactly 10ml of solvent for accurate results.



SAMPLE ANALYSIS- TINCTURE

1. Add contents of syringe to vial.



2. Place cap firmly on vial. Press forward arrow on LightLab screen.
3. Place vial into shaker and strap in place, then turn on shaker. Press forward arrow on LightLab screen.

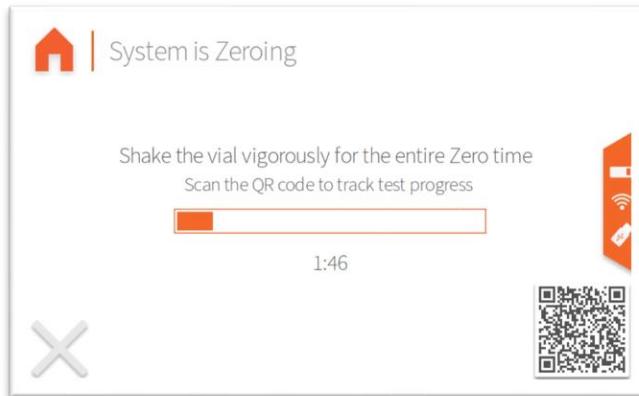


4. Ensure the valve is set to RUN. Press forward arrow on LightLab screen.

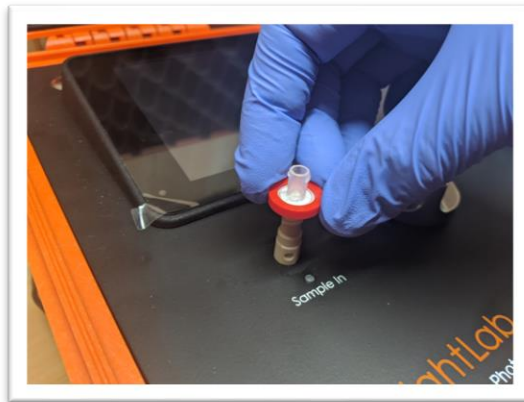


SAMPLE ANALYSIS- TINCTURE

5. Press the “Start” button. The zero process will begin, and a shaker timer will appear. Note in some cases LightLab will determine that more time is required to ensure a successful sample run. LightLab will beep and indicate that the shaker should be stopped while the system finishes up zeroing.



6. Once Zero is complete, add syringe filter onto sample port. Press forward arrow on screen.



7. Set valve to L. Press forward arrow on screen.



SAMPLE ANALYSIS- TINCTURE

8. Remove cap from vial and pull at least 4 ml of sample into syringe used previously. NOTE: Some tinctures may create an emulsion, where oil droplets are suspended in LightLab solvent like oil-based salad dressing. Do not let the sample settle out before pulling sample into syringe. If the sample is settled, a vigorous hand shake will typically re-suspend the sample. If the sample settles before pulling it into the syringe, LightLab will report a lower-than-expected value. Press forward arrow on screen.



9. Place syringe on syringe filter at sample port by gently twisting it on about a quarter turn. Press forward arrow on screen. Note a large (25.4mm) syringe filter is recommended. If the sample is too difficult to inject with a syringe filter in place, and is known to be free of particulates, the sample can be injected with no filter. Note not using a filter increases the risk of clogging your LightLab.



SAMPLE ANALYSIS- TINCTURE

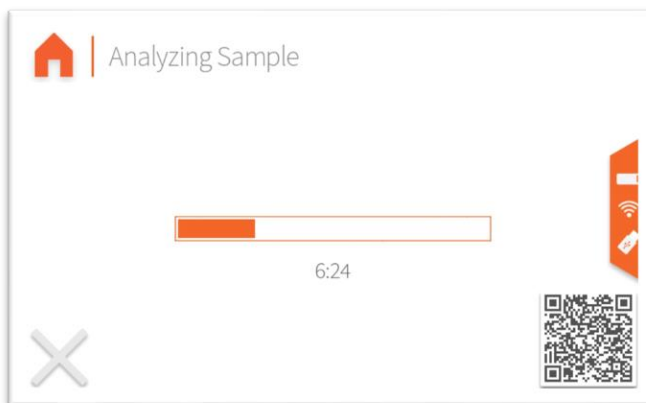
10. Slowly inject at least 3ml of sample into sample port. The exact amount isn't important. There will be some resistance when injecting a sample- this is normal. Press forward arrow on screen.



11. Set valve to R. Press forward arrow on screen.

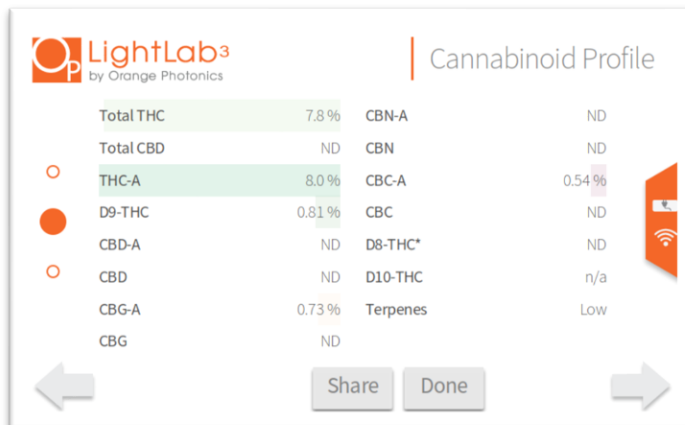
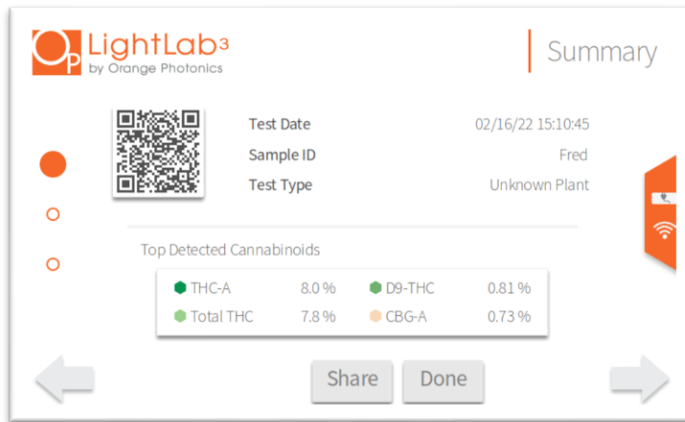


12. Press Start. LightLab will begin to analyze the sample. Results will be ready in 8 minutes and 30 seconds.



SAMPLE ANALYSIS- TINCTURE

13. Once sampling is complete, results are displayed on the screen. If a USB drive is connected, results will be added to a comma separated value (Excel compatible) file. If internet is connected, capturing the QR code will direct your mobile device to the Mobile Monitoring results page. Pressing the “Share” button will share results to a mobile phone or email. Do not reuse syringe, filter or vial for future tests unless re-running the same sample.

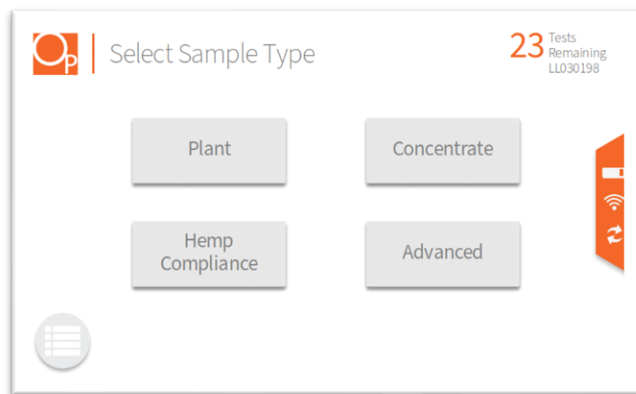


SAMPLE ANALYSIS- ISOLATE

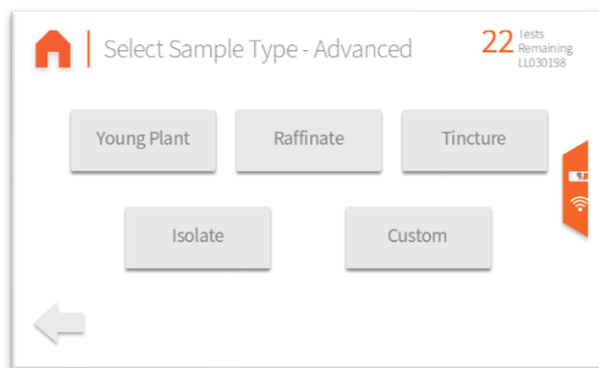
Sample Analysis- Isolate

Isolate Analysis should be used for isolated, powdered/crystalline nearly pure material, typically CBD. This mode will indicate the purity of the isolate material. Note that sample preparation and analysis errors are often higher than expected. LightLab will NOT be able to tell wither an isolate is 99.8 vs 99.7% pure. Errors for isolates are typically +/- 3%. A good quality analytical balance is required for accurate measurement since the provided LightLab scale contributes significant error to an isolate measurement.

1. Select "Advanced" as the sample type from the main screen.



2. Select the type of sample to be measured from the new list that appears (Isolate for this section).



SAMPLE ANALYSIS- ISOLATE

3. Add sample tags to the sample record if desired. Sample tags are free form text fields for storing information about the sample. They will be saved along with the sample results and can be accessed later.

Enter tags for this sample

23 Tests Remaining
LL030198

Sample ID

Cultivar

Notes

Operator

4. [FOR HS UNITS ONLY, NOT REQUIRED FOR STANDARD LIGHTLAB 3] LightLab 3 HS requires a flush before analysis. The flush clears the sample loop before analysis and ensures that no cross contamination occurs when the valve is moved. The flush requires injecting approximately 3ml into the LightLab Sample In port. The valve should not be moved during the injection.

Injector Flush

3 Tests Remaining
LL030455

Fill clean syringe with at least 3ml solvent

Attach syringe to Sample In port. DO NOT move valve position

Inject about 3ml of solvent

SAMPLE ANALYSIS- ISOLATE

5. Weigh out 0.050g (+/-0.005g) of sample into vial using a laboratory balance. Type in the exact sample reading on the scale. Press forward arrow on the screen.



6. Add **30ml** of solvent by following the steps below 3 times:
 - a. Connect the syringe to the solvent cap and pull plunger up to fill syringe. Fill syringe with at least 10ml of solvent.



SAMPLE ANALYSIS- ISOLATE

- b. Invert the syringe so that the bubble floats to the tip. Depress the plunger to remove the air bubbles and get the syringe volume to exactly 10ml. A tissue may be used to catch any excess solvent.

NOTE: It is important to ensure the syringe has exactly 10ml of solvent for accurate results.



- c. Add contents of syringe to vial.



7. Place cap firmly on vial. Press forward arrow on LightLab screen.

SAMPLE ANALYSIS- ISOLATE

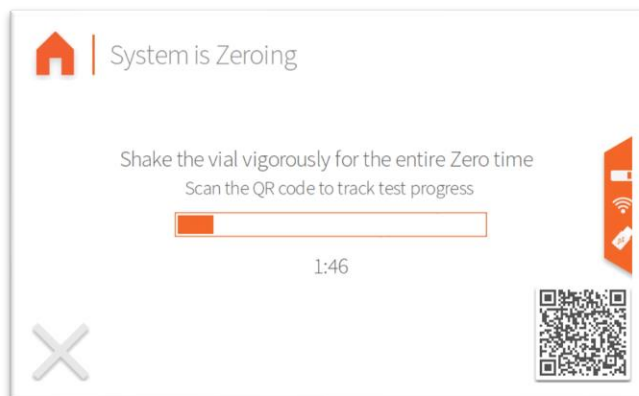
- Place vial into shaker and strap in place, then turn on shaker. Press forward arrow on LightLab screen.



- Ensure the valve is set to R. Press forward arrow on LightLab screen.

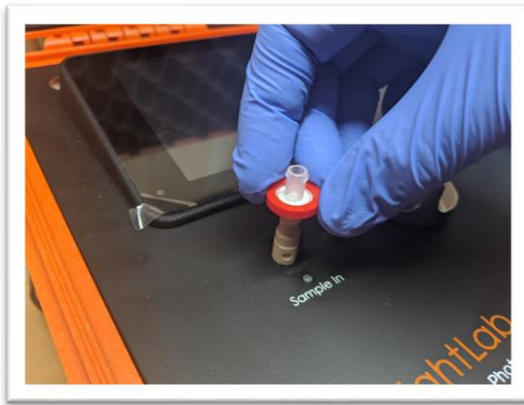


- Press the "Start" button. The zero process will begin, and a shaker timer will appear. Note in some cases LightLab will determine that more time is required to ensure a successful sample run. LightLab will beep and indicate that the shaker should be stopped while the system finishes up zeroing.

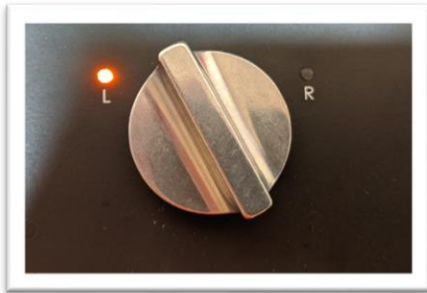


SAMPLE ANALYSIS- ISOLATE

11. Once Zero is complete, add syringe filter onto sample port. Press forward arrow on screen.



12. Set valve to L. Press forward arrow on screen.



13. Remove cap from vial and pull at least 4 ml of sample into syringe used previously. The exact amount of sample isn't important. Press forward arrow on screen.

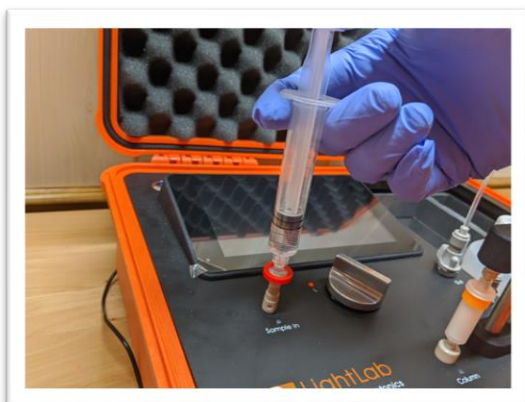


SAMPLE ANALYSIS- ISOLATE

14. Place syringe on syringe filter at sample port by gently twisting it on about a quarter turn. Press forward arrow on screen.



15. Slowly inject at least 3ml of sample into sample port. The exact amount isn't important. There will be some resistance when injecting a sample- this is normal. Press forward arrow on screen.

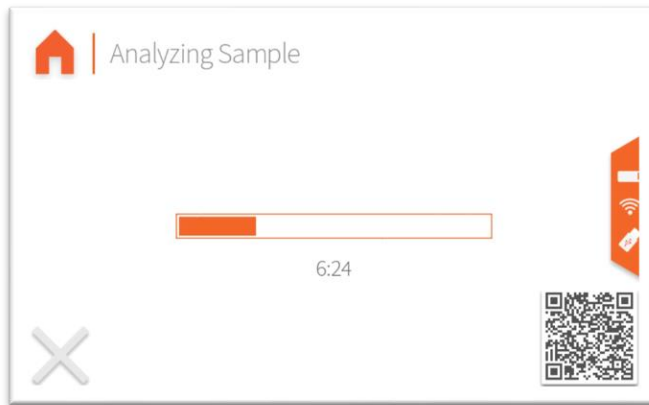


16. Set valve to R. Press forward arrow on screen.

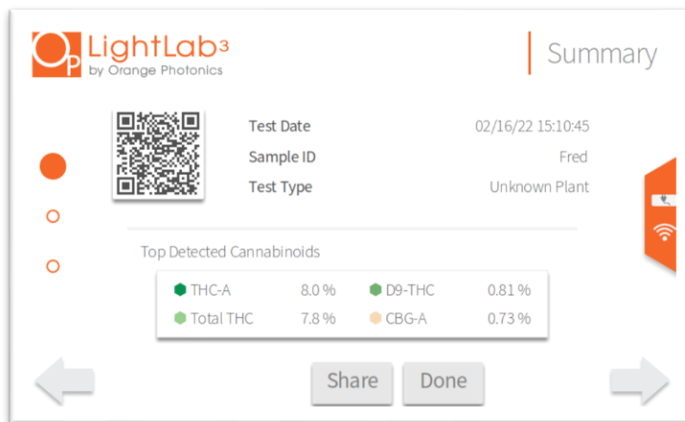


SAMPLE ANALYSIS- ISOLATE

17. Press Start. LightLab will begin to analyze the sample. Results will be ready in 8 minutes and 30 seconds.



18. Once sampling is complete, results are displayed on the screen. If a USB drive is connected, results will be added to a comma separated value (Excel compatible) file. If internet is connected, capturing the QR code will direct your mobile device to the Mobile Monitoring results page. Pressing the "Share" button will share results to a mobile phone or email. Do not reuse syringe, filter or vial for future tests unless re-running the same sample.



SAMPLE ANALYSIS- ISOLATE

LightLab³
by Orange Photonics

Cannabinoid Profile

| | | | |
|-----------|-------|----------|-------|
| Total THC | 7.8% | CBN-A | ND |
| Total CBD | ND | CBN | ND |
| THC-A | 8.0% | CBC-A | 0.54% |
| D9-THC | 0.81% | CBC | ND |
| CBD-A | ND | D8-THC* | ND |
| CBD | ND | D10-THC | n/a |
| CBG-A | 0.73% | Terpenes | Low |
| CBG | ND | | |

Share Done

LightLab³
by Orange Photonics

Details

| | | | |
|---------------|-------------------|-------------|---------------|
| Date | 02/16/22 15:10:45 | Test Type | Unknown Plant |
| Serial Number | LL030001 | Moisture | 0.0% |
| LightLab | Hugh's Dev Unit | Weight | 0.316 g |
| Operator | | Solvent | 30 ml |
| Sample ID | Fred | Temperature | 0.3 C |
| Method | LightLab HPLC | Cultivar | |
| Notes | | | |

Share Done

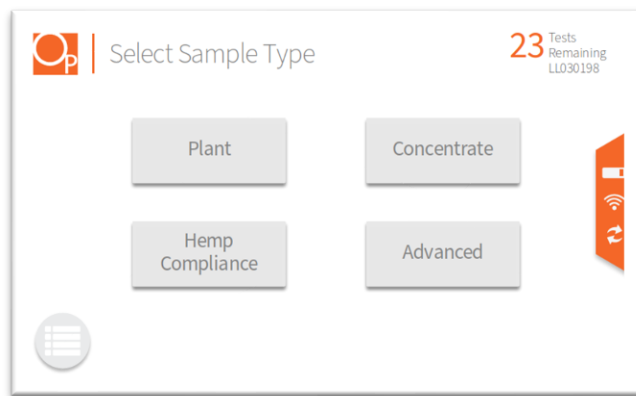
SAMPLE ANALYSIS- CUSTOM

Sample Analysis- Custom

Custom should be selected when analyzing products that fall outside of any standard LightLab measurable products. Custom analysis may require specialized sample preparation techniques. We recommend validating any sample preparation and analysis before routine analysis. Some samples may not be possible to measure with a standard LightLab analyzer. Contact Orange Photonics support if assistance is required.

NOTE: Custom is an advanced analysis that may require modifications to the procedure below depending on the data/reporting required. It is not recommended for novice LightLab users.

1. Select “Advanced” as the sample type from the main screen.

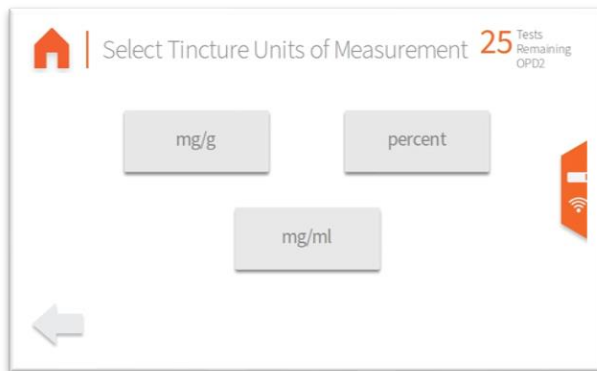


1. Select the type of sample to be measured from the new list that appears (Custom for this section).

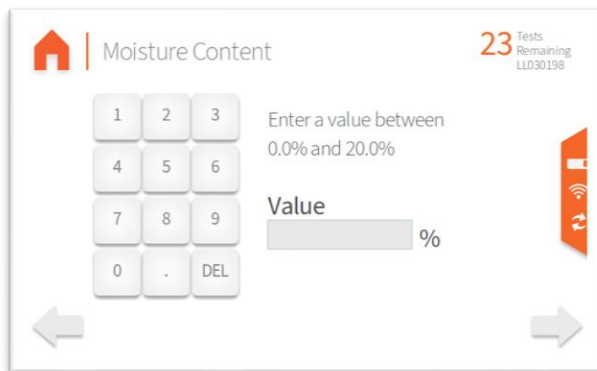


SAMPLE ANALYSIS- CUSTOM

2. Select the desired units for analysis. For typical analysis, percent by weight is used. In cases where the sample to be analyzed is an edible, tincture or other dosed product, mg/g or mg/ml may be more appropriate. Contact Orange Photonics Support if assistance is required.

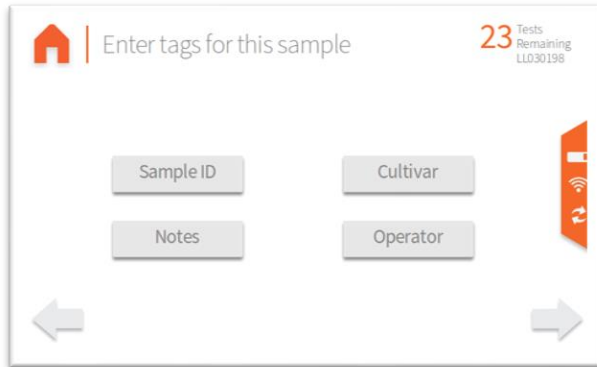


3. If Moisture Correction is enabled, enter the moisture content of the sample to be run. If your sample is not a wet plant, the moisture is not known, you do not want to correct for moisture, or you wish to replicate a lab's "As-Received" data, then enter 0 to skip this step and proceed to the next screen.

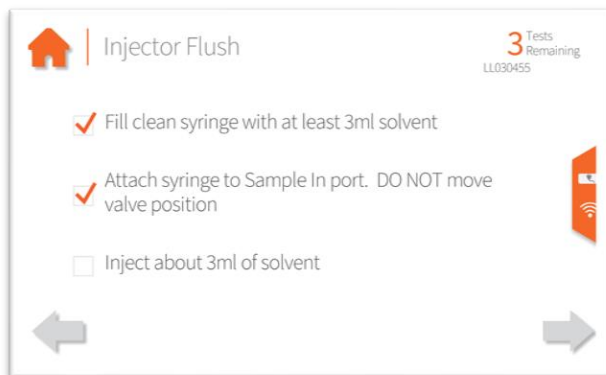


SAMPLE ANALYSIS- CUSTOM

4. Add sample tags to the sample record if desired. Sample tags are free form text fields for storing information about the sample. They will be saved along with the sample results and can be accessed later.



5. [FOR HS UNITS ONLY, NOT REQUIRED FOR STANDARD LIGHTLAB 3] LightLab 3 HS requires a flush before analysis. The flush clears the sample loop before analysis and ensures that no cross contamination occurs when the valve is moved. The flush requires injecting approximately 3ml into the LightLab Sample In port. The valve should not be moved during the injection.



6. Gather a representative sample to be analyzed. The amount of sample required will vary depending on the potency and type of sample. LightLab analyzer can analyze between 0.1-3mg cannabinoid/1ml LightLab solvent. The recommended target value is 1.5mg cannabinoid/1ml LightLab solvent. We recommend using at least 10ml of LightLab solvent and 100mg of sample for best accuracy.
7. Place scale on level surface and turn on.

SAMPLE ANALYSIS- CUSTOM



8. Check calibration of scale by placing 10g calibration weight on scale. Results should be between 9.997 and 10.003. If not proceed to Section 11 to recalibrate scale.



SAMPLE ANALYSIS- CUSTOM

9. Place a vial on the scale and press “tare”. Ensure scale now reads zero with the vial resting on it. Press forward arrow on the LightLab screen.



10. Add the amount of sample required for analysis to the vial (1-99999mg is allowed).



SAMPLE ANALYSIS- CUSTOM

11. Type in the exact sample reading on the scale. Press forward arrow on the screen.

Sample Weight

22 Tests Remaining
LL030198

Enter a weight between
0.001 g and 99.999 g

Weight g

12. Enter the exact amount of total volume added into LightLab. If the sample is a liquid, the amount will be the amount of LightLab solvent plus the amount of sample volume. If the sample is dry, enter only the amount of LightLab solvent added. Press the forward arrow on the screen.

NOTE: Be careful when entering the amount of solvent! Adding a different amount than is indicated on the LightLab screen will cause incorrect results to be displayed.

NOTE: Depending on the type of sample, LightLab Solvent A and B may be used. Always use solvent A and B in a 2:1 ratio.

Total Volume

22 Tests Remaining
LL030198

Enter a volume between
1.0 ml and 100.0 ml

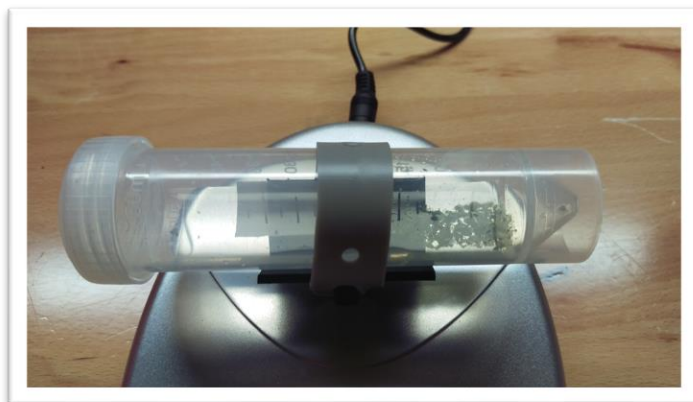
Volume ml

SAMPLE ANALYSIS- CUSTOM

13. Add desired amount of solvent to vial.



14. Perform sample extraction required for analysis. This may involve using sample warmer and/or shaker or external equipment. Ensure sample is fully extracted into LightLab solvent to ensure accurate results.

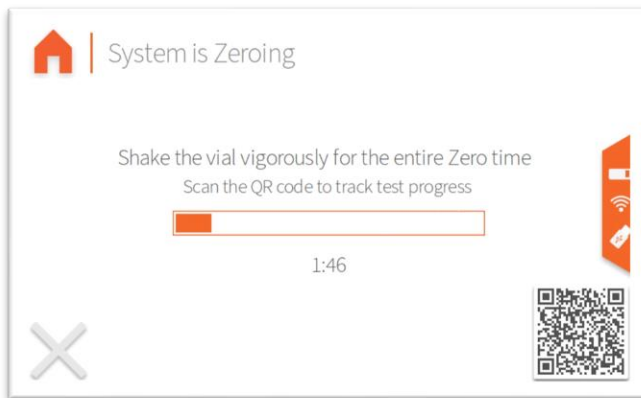


19. Ensure the valve is set to R. Press forward arrow on LightLab screen.

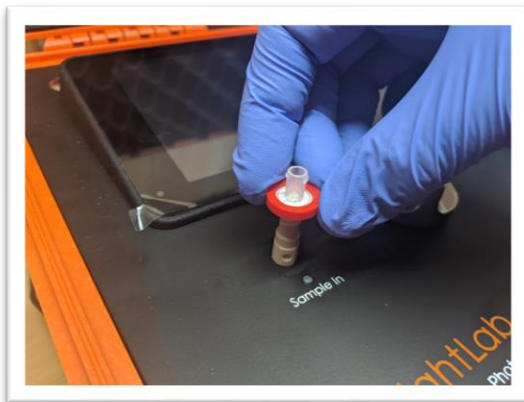


SAMPLE ANALYSIS- CUSTOM

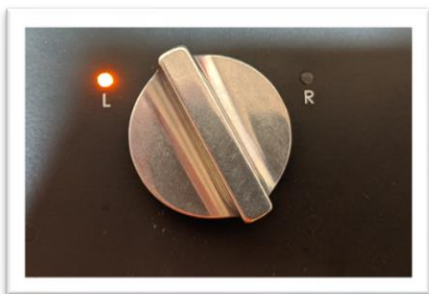
20. Press the "Start" button. The zero process will begin, and a shaker timer will appear. Note in some cases LightLab will determine that more time is required to ensure a successful sample run. LightLab will beep and indicate that the shaker should be stopped while the system finishes up zeroing.



21. Once Zero is complete, add syringe filter onto sample port. Press forward arrow on screen.



22. Set valve to L. Press forward arrow on screen.



SAMPLE ANALYSIS- CUSTOM

23. Remove cap from vial and pull at least 3 ml of sample into syringe used previously. The exact amount of sample isn't important. Press forward arrow on screen.



24. Place syringe on syringe filter at sample port by gently twisting it on about a quarter turn. Press forward arrow on screen.



25. Slowly inject at least 3ml of sample into sample port. The exact amount isn't important. There will be some resistance when injecting a sample- this is normal. Press forward arrow on screen.

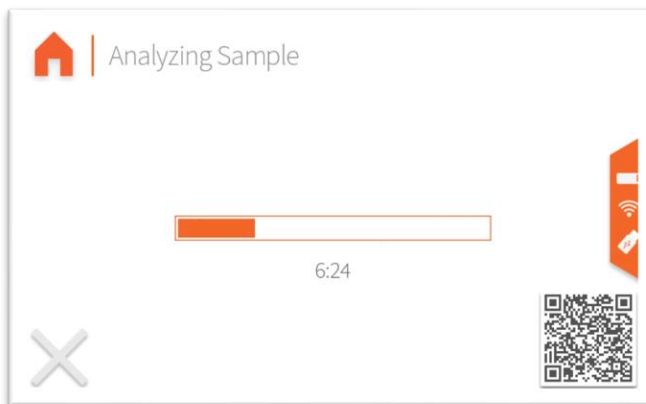


SAMPLE ANALYSIS- CUSTOM

26. Set valve to R. Press forward arrow on screen.



27. Press Start. LightLab will begin to analyze the sample. Results will be ready in 8 minutes and 30 seconds.




28. Once sampling is complete, results are displayed on the screen. If a USB drive is connected, results will be added to a comma separated value (Excel compatible) file. If internet is connected, capturing the QR code will direct your mobile device to the Mobile Monitoring results page. Pressing the “Share” button will share results to a mobile phone or email. Do not reuse syringe, filter or vial for future tests unless re-running the same sample.

SAMPLE ANALYSIS- CUSTOM

LightLab³
by Orange Photonics

Summary


 Test Date: 02/16/22 15:10:45
 Sample ID: Fred
 Test Type: Unknown Plant

Top Detected Cannabinoids

| | | | |
|-----------|-------|--------|--------|
| THC-A | 8.0 % | D9-THC | 0.81 % |
| Total THC | 7.8 % | CBG-A | 0.73 % |

Share Done

LightLab³
by Orange Photonics

Cannabinoid Profile

| | | | |
|-----------|--------|----------|--------|
| Total THC | 7.8 % | CBN-A | ND |
| Total CBD | ND | CBN | ND |
| THC-A | 8.0 % | CBC-A | 0.54 % |
| D9-THC | 0.81 % | CBC | ND |
| CBD-A | ND | D8-THC* | ND |
| CBD | ND | D10-THC | n/a |
| CBG-A | 0.73 % | Terpenes | Low |
| CBG | ND | | |

Share Done

LightLab³
by Orange Photonics

Details

| | | | |
|---------------|-------------------|-------------|---------------|
| Date | 02/16/22 15:10:45 | Test Type | Unknown Plant |
| Serial Number | LL030001 | Moisture | 0.0% |
| LightLab | Hugh's Dev Unit | Weight | 0.316 g |
| Operator | | Solvent | 30 ml |
| Sample ID | Fred | Temperature | 0.3 C |
| Method | LightLab HPLC | Cultivar | |
| Notes | | | |

Share Done

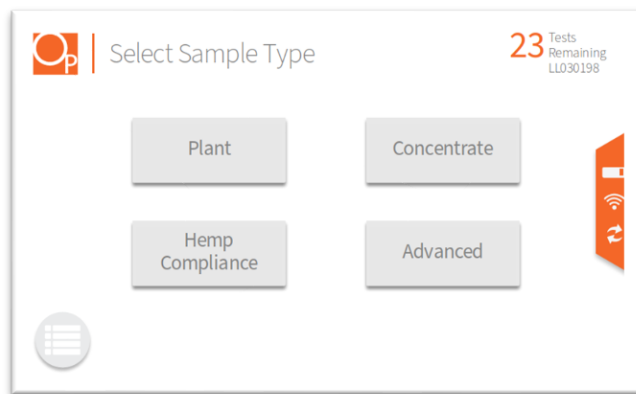
SAMPLE ANALYSIS- HEMP COMPLIANCE

Sample Analysis- Hemp Compliance

LightLab may be purchased with an optional Hemp Compliance Module which allows detection of THCA and D9THC in hemp samples down to 0.05% with high precision. When using this mode, only THCA and D9THC values will be displayed. To determine other cannabinoids, a separate analysis must be made. Hemp analysis can be used on dried hemp material with a maximum THCA or D9THC level of 5%. Note plant material analyzed with Hemp Compliance mode must be dried prior to analysis. See Appendix 1 for more information on sample drying.

It is important to follow as closely as possible the sampling and sample preparation techniques used by regulators in your location. We highly recommend contacting your regulator to learn about how they will sample your crop and prepare the sample for analysis. These instructions may need to be modified to match your regulator's requirements.

1. Turn LightLab on and let the analyzer warm up for 30 minutes if measurements are critical. If the instrument has not been used in more than 3 days, we also recommend running a flush bubbles sequence to ensure the fluidic lines are clear of contaminants and LightLab is fully warmed up. Note the warmup time can be included in the 30-minute warmup.
2. Select the type of sample to be measured (Hemp Compliance for this section). If the Hemp Compliance button is not visible, contact Orange Photonics to purchase a hemp compliance module.



3. Add sample tags to the sample record if desired. Sample tags are free form text fields for storing information about the sample. They will be saved along with the sample results and can be accessed later.

SAMPLE ANALYSIS- HEMP COMPLIANCE

Home | Enter tags for this sample 23 Tests Remaining
LL030198

Sample ID Cultivar

Notes Operator

4. [FOR HS UNITS ONLY, NOT REQUIRED FOR STANDARD LIGHTLAB 3] LightLab 3 HS requires a flush before analysis. The flush clears the sample loop before analysis and ensures that no cross contamination occurs when the valve is moved. The flush requires injecting approximately 3ml into the LightLab Sample In port. The valve should not be moved during the injection.

Home | Injector Flush 3 Tests Remaining
LL030455

- Fill clean syringe with at least 3ml solvent
- Attach syringe to Sample In port. DO NOT move valve position
- Inject about 3ml of solvent

5. Dry at least 3g of sample if it is plant material that is not already dry. The sample should be completely dried, see Appendix 1 for drying suggestions.

SAMPLE ANALYSIS- HEMP COMPLIANCE

6. Prepare at least 1g of sample with the included electric grinder. See “LightLab Electric Grinder Instructions” section for full grinder instructions. We recommend following your local sampling guidelines and grinding the amount of plant required by your local jurisdiction. This is generally in the range of 6-12” of the top of a plant. Press forward arrow on the LightLab screen.



7. Place scale on level surface and turn on.



SAMPLE ANALYSIS- HEMP COMPLIANCE

8. Check calibration of scale by placing 10g calibration weight on scale. Results should be between 9.997 and 10.003. If not proceed to Section 11 to recalibrate scale.



9. Place a vial on the scale and press "tare". Ensure scale now reads zero with cap resting on it. Press forward arrow on the LightLab screen.



SAMPLE ANALYSIS- HEMP COMPLIANCE

10. Add 0.5g (+/- 0.05g) to the scale. Press forward arrow on the screen.



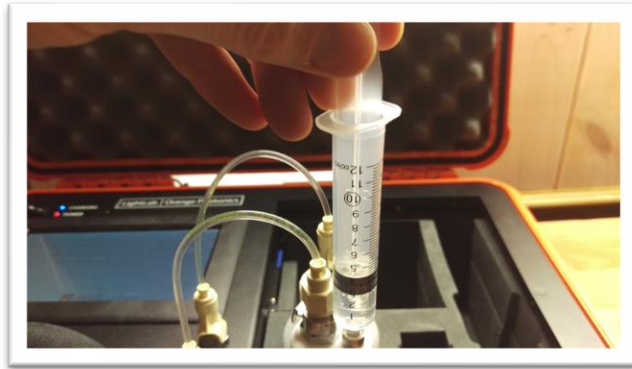
11. Type in the exact sample reading on the scale. 0.450-0.550 g is an acceptable range. Press forward arrow on the screen.



SAMPLE ANALYSIS- HEMP COMPLIANCE

12. Add **20ml** of solvent by following the steps below twice:

- a. Connect the syringe to the solvent cap and pull plunger up to fill syringe. Fill syringe with at least 10ml of solvent.



- b. Invert the syringe so that the bubble floats to the tip. Depress the plunger to remove the air bubbles and get the syringe volume to exactly 10ml. A tissue may be used to catch any excess solvent.

NOTE: It is important to ensure the syringe has exactly 10ml of solvent for accurate results.



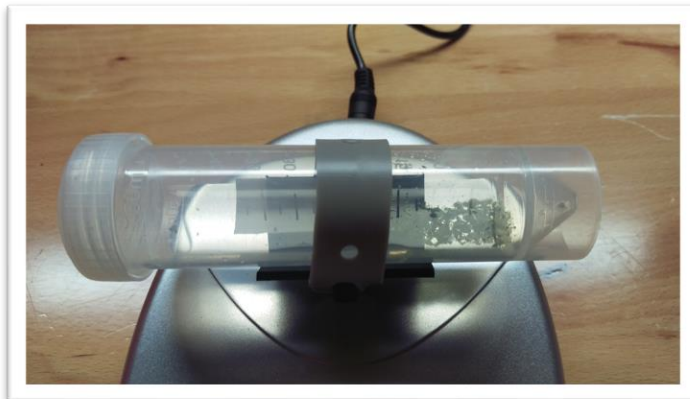
SAMPLE ANALYSIS- HEMP COMPLIANCE

c. Add contents of syringe to vial. Place cap firmly on vial.



13. Place cap firmly on vial. Press forward arrow on LightLab screen.

14. Place vial into shaker and strap in place, then turn on shaker. Press forward arrow on LightLab screen.

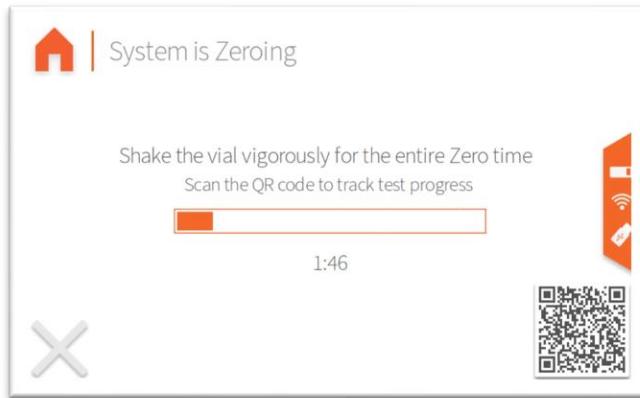


29. Ensure the valve is set to R. Press forward arrow on LightLab screen.

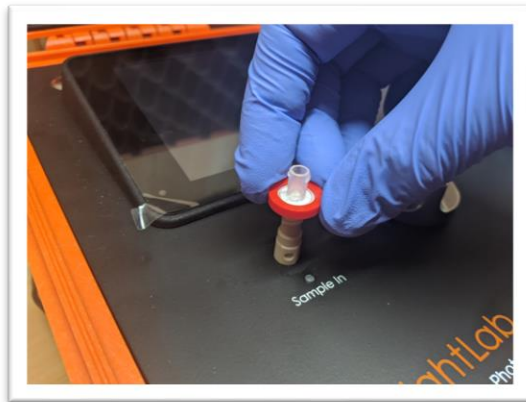


SAMPLE ANALYSIS- HEMP COMPLIANCE

30. Press the “Start” button. The zero process will begin, and a shaker timer will appear. Note in some cases LightLab will determine that more time is required to ensure a successful sample run. LightLab will beep and indicate that the shaker should be stopped while the system finishes up zeroing.



31. Once Zero is complete, add syringe filter onto sample port. Press forward arrow on screen.



32. Set valve to L. Press forward arrow on screen.



SAMPLE ANALYSIS- HEMP COMPLIANCE

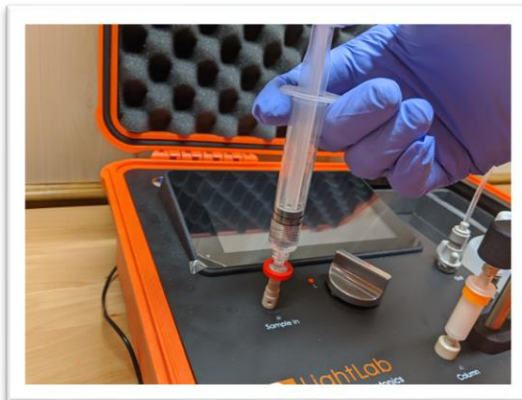
33. Remove cap from vial and pull at least 4 ml of sample into syringe used previously. The exact amount of sample isn't important. Press forward arrow on screen.



34. Place syringe on syringe filter at sample port by gently twisting it on about a quarter turn. Press forward arrow on screen.



35. Slowly inject at least 3ml of sample into sample port. The exact amount isn't important. There will be some resistance when injecting a sample- this is normal. Press forward arrow on screen.

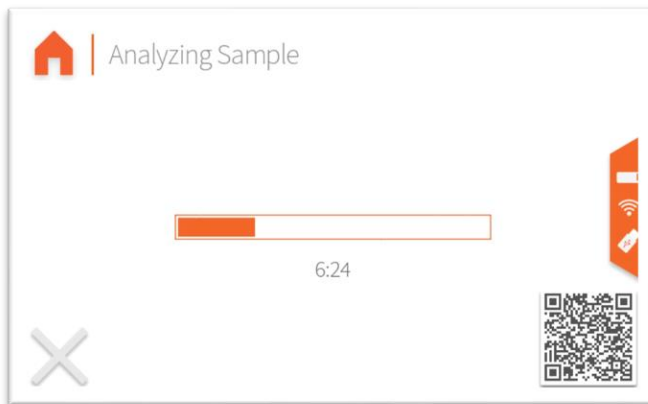


SAMPLE ANALYSIS- HEMP COMPLIANCE

36. Set valve to R. Press forward arrow on screen.

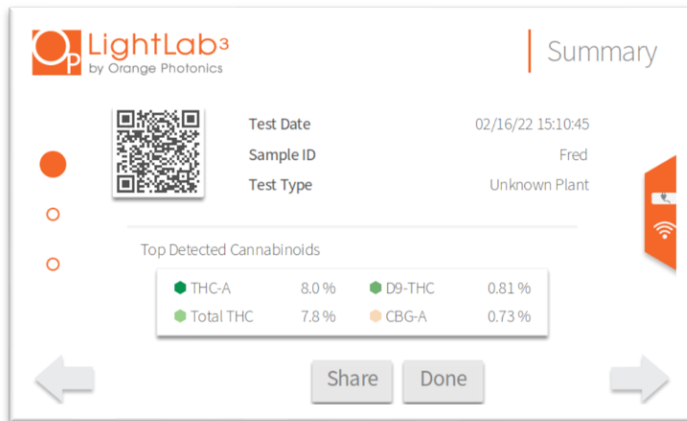


37. Press Start. LightLab will begin to analyze the sample. Results will be ready in 8 minutes and 30 seconds.



38. Once sampling is complete, results are displayed on the screen. If a USB drive is connected, results will be added to a comma separated value (Excel compatible) file. If internet is connected, capturing the QR code will direct your mobile device to the Mobile Monitoring results page. Pressing the “Share” button will share results to a mobile phone or email. Do not reuse syringe, filter or vial for future tests unless re-running the same sample.

SAMPLE ANALYSIS- HEMP COMPLIANCE



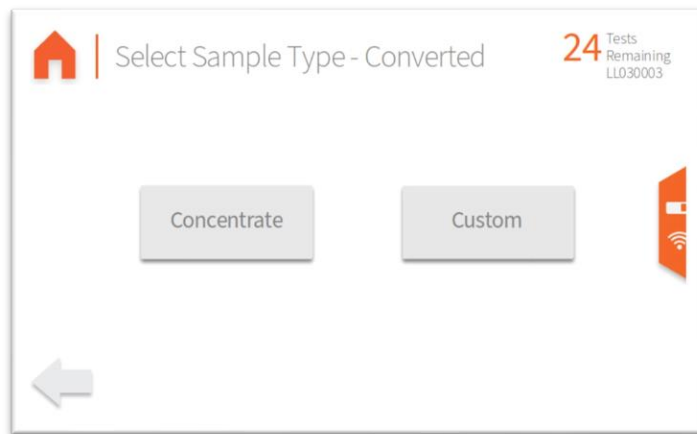
15. If LightLab is going to be shut down after a hemp compliance tests, it is recommended to flush the injection port with clean LightLab solvent. This avoids contamination of the internal check valves from the high concentration hemp material that can cause check valves to leak.

SAMPLE ANALYSIS- CONVERTED CANNABINOIDS

Sample Analysis- Converted Cannabinoids

LightLab may be purchased with an optional Converted Cannabinoids Module which enables an extra sample type button for converted cannabinoid analysis. Note these analysis modes should be used only when samples are expected to contain converted cannabinoids or are labeled with converted cannabinoids. Typically these are labeled as containing “THC-O, THCO, HHC or THCP”.

1. Select the “Converted Cannabinoid” Analysis type from the “Advanced” screen. Select the type of sample to be measured. Concentrates are directly supported; other products can be analyzed with the “Custom Converted Cannabinoid” mode. See the “Sample Analysis- Custom” section for more information on custom analysis.



2. Follow the on-screen instructions to complete the analysis. Note the process for analyzing concentrates is the same for standard concentrates, see section “Sample Analysis- Concentrates” for detailed instructions.

SHUTTING DOWN

Shutting Down

If LightLab is typically left in one location, it does not need to be completely packed away and can remain set up. If the device will be used again in less than one day, we recommend simply turning off the analyzer. If the device will not be used for more than a day, we recommend removing the LightLab Solvent cap and replacing it with the storage cap to avoid excessive evaporation. The column can remain in place in either case.

To completely shut down and pack away LightLab use the following steps:

1. Before shutting down the instrument, we recommend flushing the sample input lines. Doing so will clean out any debris that has built up in the lines. To flush the lines:
 - a. Fill a 10ml syringe about halfway (5ml) with LightLab solvent. If available, pure ethanol, pure methanol, or denatured alcohol will work even better than LightLab solvent.



- b. Once it is halfway filled, pull the syringe up to 10ml. There should be half solvent and half air in the syringe.



SHUTTING DOWN

- c. Connect the syringe to the sample input port with no syringe filter in place.



- d. Set the valve to "Run".

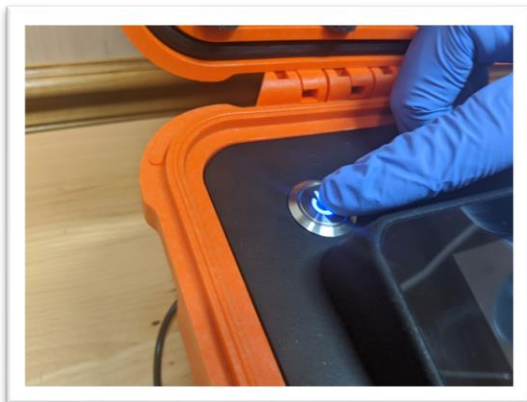


- e. Depress the syringe until both the solvent and air have flushed through the sample input and the syringe is empty.



SHUTTING DOWN

2. Turn off LightLab and unplug system.

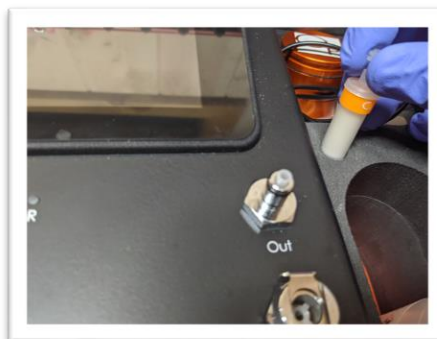
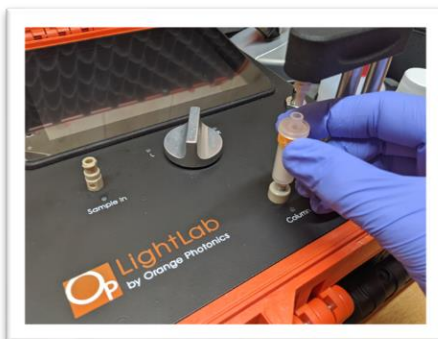


3. The AC adapter and plug can be stored in the right side of the storage compartment.



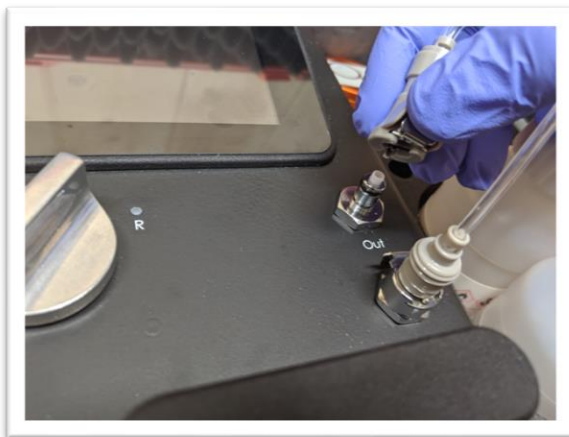
4. Remove Selective Separation Column by lifting column holder. Place caps on the column. Close column holder.

NOTE: It is important to keep the column wet for best performance. Always immediately replace caps when storing the column, do not store without caps in place. The column can be stored in the small hole near the center of the instrument.

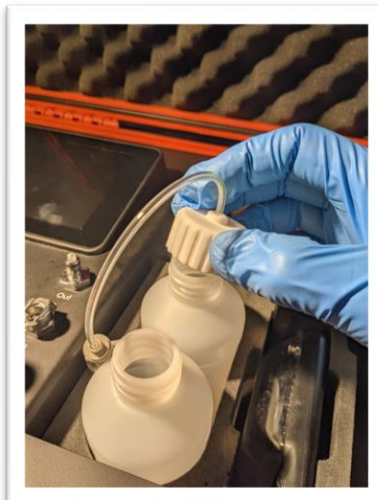
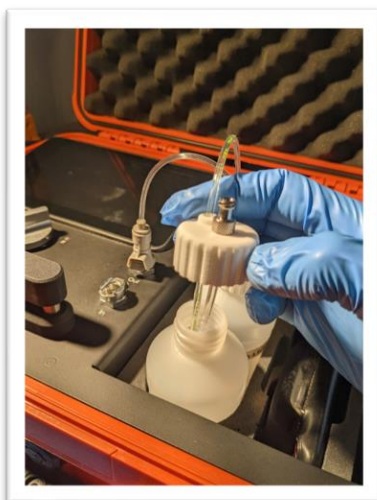


SHUTTING DOWN

5. Remove fluid lines by pressing the metal lock on the side of the fittings and place in cap bag.



6. Remove solvent and waste caps and place in bag. Place storage cap on solvent bottles and tighten firmly. Note the red cap is meant for the waste container. Do not mix up the caps, as contamination of LightLab solvent can cause errors.



SHUTTING DOWN

7. The bag can be stored directly above the AC adapter on the right side of the storage compartment.



8. The scale can be placed in the middle of the storage compartment along with the pair of tweezers.



9. Unplug shaker power cord and place in the large storage compartment. other small parts can be placed in the large storage compartment as well.



SHUTTING DOWN

10. The shaker can be placed on top of the large compartment with the shaking mechanism toward the middle of LightLab. The case is now ready to close.



11. LightLab is now ready to travel. While the device is hardened against bumps and shaking, it is a scientific instrument and should be treated with care when transporting.

NOTE: If stored for extended periods, store device flat (as shown in the following picture) to eliminate the chance of solvent leaking from the bottles or remove any solvent from the analyzer.



SCALE CALIBRATION

Scale Calibration

Note: Refer to scale manual if your scale type is different. Most LightLab scales have nearly identical calibration instructions.

1. If the calibration weight does not read between 9.997 and 10.003g then a scale calibration is required. Make sure the scale is on a level surface and there is no significant air movement. Turn scale on and wait until scale reads 0.000g.



2. Press and hold the Mode/Cal button for 3 seconds. CAL should be displayed on the screen.



3. Press the Cal button once more. 10.000 will start flashing on the scale. Add a 10g calibration weight to the scale.

SCALE CALIBRATION



4. After a few seconds, the scale will begin to flash 20.000. Add the second calibration weight.



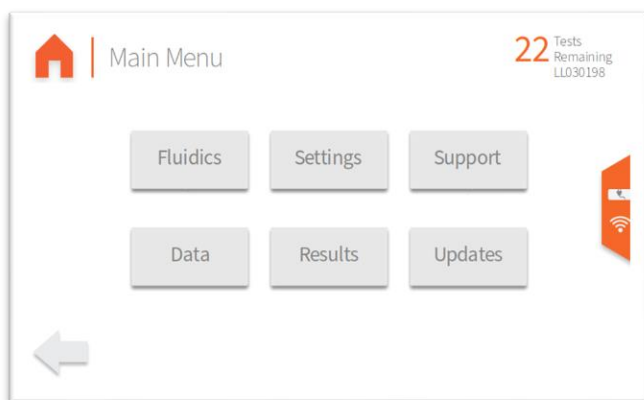
5. After a few seconds, the scale will display PASS. The scale is now calibrated.



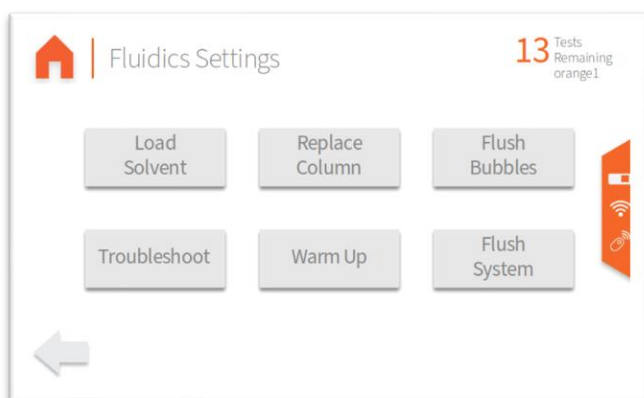
LIGHTLAB SETTINGS

LightLab Main Menu

The main menu can be accessed by pressing the menu button on the home screen. The settings have 6 main categories.



FLUIDICS



Load Solvent

When the LightLab solvent runs low, select “Load Solvent” button, and follow instructions to ensure solvent is loaded without air bubbles. This requirement may be skipped if solvent is simply added to the sample vial without disturbing any of the fluidics lines. Be careful not to allow the waste container to become overfilled!

LIGHTLAB SETTINGS

1. Detach waste fluid line and remove waste cap. Remove waste bottle and replace storage cap. Dispose of solvent waste per applicable local or company regulations. Press forward arrow on screen.



2. Detach solvent fluid line and remove solvent cap. Remove solvent bottle and replace storage cap. Remaining solvent can be added to waste bottle.



3. Add new solvent and waste bottles and reconnect fluid lines.



LIGHTLAB SETTINGS

4. LightLab will purge any bubbles that are introduced from the solvent load and purge the bubble trap that catches stray bubbles. Once complete, LightLab will be ready for analysis again.



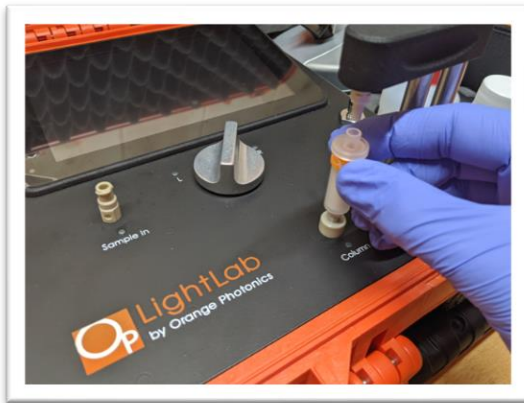
Replace Column

1. The Selective Separation Column will last for 25 tests before replacement is needed. A counter in the upper right corner of the screen shows the number of tests left on the column. Once the counter reaches zero, the column should be replaced. If prompted by the following screen, follow instructions to replace solvent. The column replace procedure can also be accessed through the Fluidics settings page.

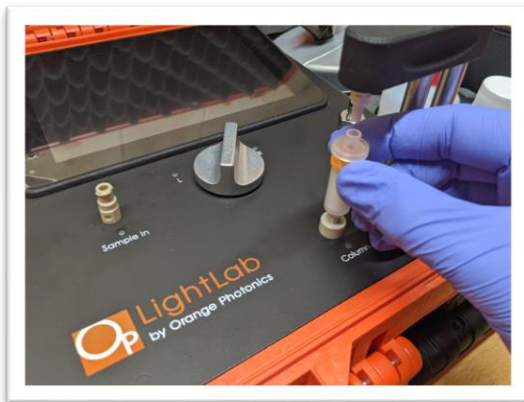


LIGHTLAB SETTINGS

2. Remove old column by lifting the column holder arm and then pulling column out of holder. Twisting the column will facilitate removing it.



3. Remove caps on new column and place into column holder.

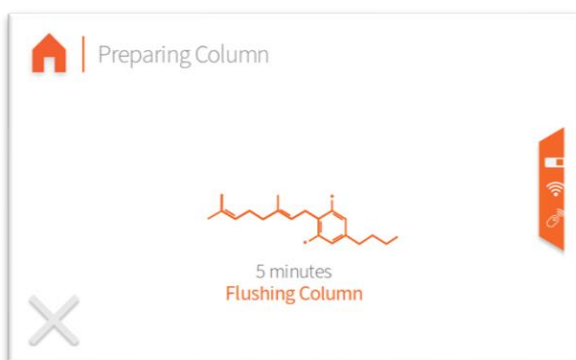


LIGHTLAB SETTINGS

4. Close column holder firmly onto Selective Separation Column.



5. LightLab will wet the new column and clear any air bubbles. The estimated time will be displayed based on LightLab's analysis of the new column and will be updated as the column is prepared.



Flush System

If continually indicates drift or air bubbles, indicates that results were poor or LightLab solvent does not flow through system, the instrument may need to be flushed. LightLab will indicate if flushing is needed in most cases. Flushing the system forces solvent through the device at full pressure to dislodge any debris that may be in the fluid lines. Flushing is not required under normal conditions, contact Orange Photonics Support for help if you are having issues with performance. When abnormal flow occurs, we recommend flushing in the following order:

- Flush Bubbles- a bubble is more likely than a clog and LightLab may seem clogged when in fact a bubble is stuck in the system.
- Clear Sample Input- the most likely place for a clog to occur is in the sample input, so flushing the input out is most likely to solve an issue.
- Flush Forward- generally used to see if LightLab solvent is flowing and for general flushing of LightLab system.

LIGHTLAB SETTINGS

- Flush Backward- This should be only done when other flushes fail to help. Note that flushing backward can produce bubbles in difficult to clear places, so running a flush bubbles after flush backward is recommended.

Flush Bubbles

If LightLab warns that bubbles were detected or if the instrument fails during a sample, we recommend flushing bubbles. Normal operation of LightLab should clear most bubbles. In some instances, such as accidentally running out of solvent, or forgetting to put caps on a column, bubbles may become persistent. This setting helps to remove bubbles that are trapped in the internal fluidics. If the column or fluidics have been removed after warmup, a flush bubbles run is highly recommended to ensure all air bubbles introduced are flushed out.

Make sure the system has solvent and that the column is in place before running a flush bubbles routine. During the process, the pump will reverse flow and bubbles will appear at inlet and outlet tubing. This is normal.

Flush Forward

In some cases, it may be desirable to flush your LightLab. Normal operation does not require this procedure, but in the following cases it may allow the system to correct abnormal operations, for example if an injection was made at the incorrect time or a sample run was aborted before a sample has fully cleared the column.

Make sure the system has solvent and that the column is in place before running a flush forward.

Flush Backward

Flushing backward should only be used when a clog is present. This will run the pump at full speed backward, dislodging particles that are normally caught when the pump runs forward. This can exacerbate bubble problems, so after running a flush backwards it is recommended to follow up with a flush bubbles sequence. Never run flush backward without the reverse flushing hardware in place. This procedure should only be used if a clog is present.

NOTE: always remove the column when flushing backward!

LIGHTLAB SETTINGS

1. Remove Selective Separation column from device and close column holder

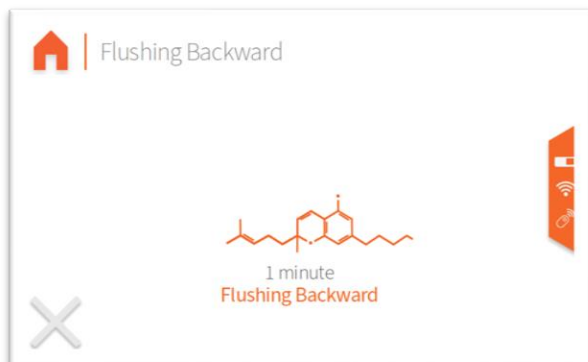


2. Remove sample fluid lines from solvent and waste bottle. Replace with flushing lines. The flushing lines have opposing male and female ends. The solvent bottle should be connected to the OUT on the instrument and the waste should be connected to the IN on the instrument. Press forward arrow on screen.



LIGHTLAB SETTINGS

3. Press Start button to turn on pump. LightLab indicates that the valve should be moved halfway through flushing.



Flush Bubble Trap

LightLab contains an integrated bubble trap that will collect stray bubbles coming from the solvent bottles. If large bubbles are seen entering LightLab, we recommend flushing the bubble trap so that the trap does not become overfilled and allows bubbles to enter the fluidics system. Flushing the bubble trap will clear any bubbles present. The bubble trap is also cleared during warmup.

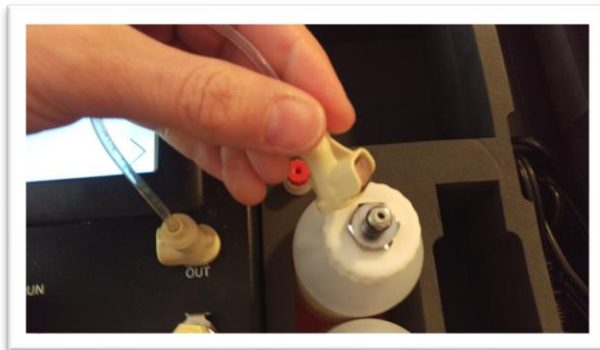
Note new style fluidics caps with no metal connector on the cap are required for the best bubble trap performance. Contact Orange Photonics sales if latest generation caps are not present on your system.

Clearing Sample Input

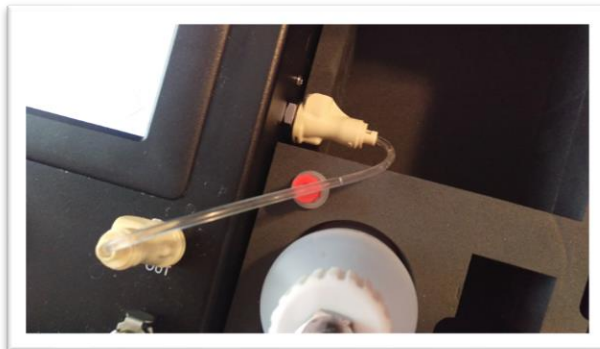
If your LightLab becomes difficult or impossible to inject, the injection port may be clogged. Do not continue to attempt to inject, as this can further embed a clog! Instead, follow the instructions below, which will redirect pump flow through the sample input port to dislodge any clogs. If you still cannot inject after attempting to clear the sample input, contact Orange Photonics Support.

LIGHTLAB SETTINGS

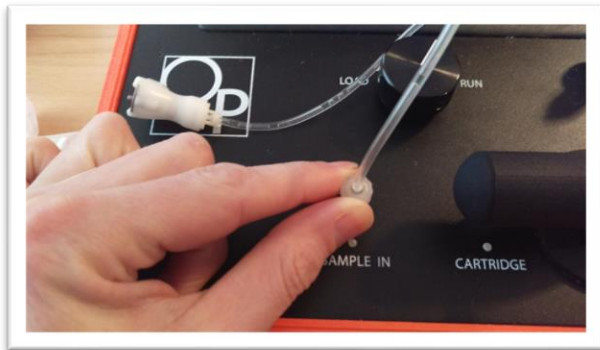
1. Disconnect the waste line from the waste container. Press forward arrow on screen.



2. Connect waste line to sample input flush port on the side of the instrument. Press forward arrow on screen.



3. Connect Luer end of sample flush line to Sample In port. Press forward on screen.

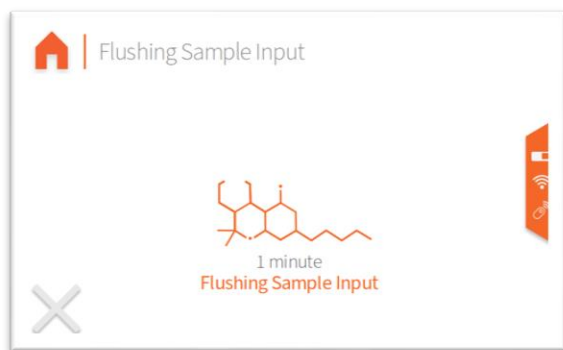


4. Connect other end of sample flush line to waste container. Press forward on screen.

LIGHTLAB SETTINGS



5. Press Start button to begin flush. LightLab solvent should come out of the Sample In port and into the waste bottle, forcing any debris in the fluid lines with it.



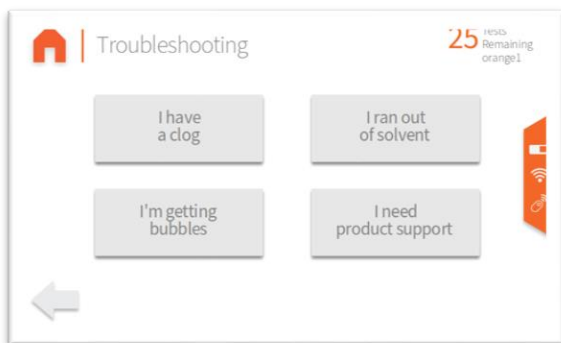
Warm Up

If the warmup routine was skipped or the instrument has not been used for more than 1 hour, a warm up is recommended. LightLab will work to ensure LightLab is ready for analysis during a warmup and the system is purged and operating normally.

LIGHTLAB SETTINGS

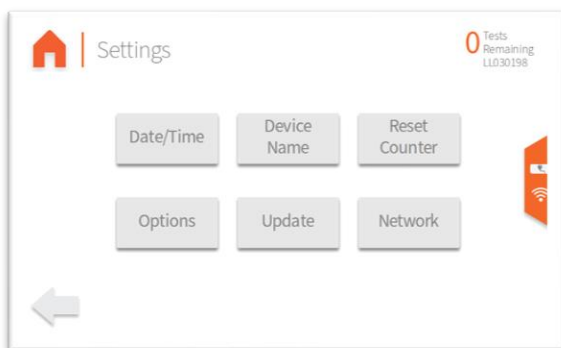
Troubleshoot

If your system is not operating as expected, the troubleshooter provides options to clear common problems with LightLab. In most cases, LightLab will guide the user toward one of these options, however they may be accessed manually here. Select the issue you are having, and LightLab will guide you through the process to correct the issue.



SETTINGS

The settings menu allows you to set different parameters for LightLab.



Date/Time

Set the date/time of LightLab including time zone. By default, LightLab uses “network time” to keep the time set. If the option is enabled, the time zone is the only adjustment required, and LightLab will sync time using the internet. Note internet must be connected for network time to work.

Device Name

If desired, a device can be named to differentiate it from other LightLabs or to personalize your LightLab. The name will be displayed in the upper right-hand corner of LightLab and saved along with any results.

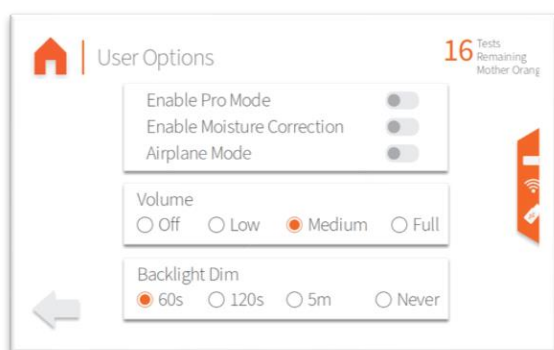
LIGHTLAB SETTINGS

Reset Counter

LightLab has a counter that shows how many tests are left before replacement. If the counter becomes out of sync, pressing this button will reset the counter value. Do not run more than 25 tests on a column since that can cause incorrect results as the column ages.

Options

LightLab has several options that can be adjusted:



Enable Pro Mode: When enabled, all the instructions are pre-completed during sample analysis, allowing for quicker sample analysis once a user is comfortable with the extraction and operation steps.

Enable Moisture Correction: LightLab allows correction for the moisture content of any plant material. When this setting is enabled, an additional screen will appear that requests moisture content information as shown below. When a moisture content is entered, it will correct the same as if it were completely dry. The following equation is used for the correction:

$$\text{Displayed Result} = \text{Uncorrected Result} / (1 - \text{moisture content})$$

Generally, if a moisture value is entered, the reported result will be higher. For example, if a plant that contains 15% THCA by weight, and a moisture correction of 10% was used, LightLab will display 16.7%:

$$\text{Displayed Result} = 15\% \text{ uncorrected} / (1 - 0.1 \text{ moisture content}) = 16.7\%$$

We recommend only using moisture correction if the value is known to avoid inaccurate results. We recommend only using a gravimetric based moisture analyzer for the most accurate results.

LIGHTLAB SETTINGS

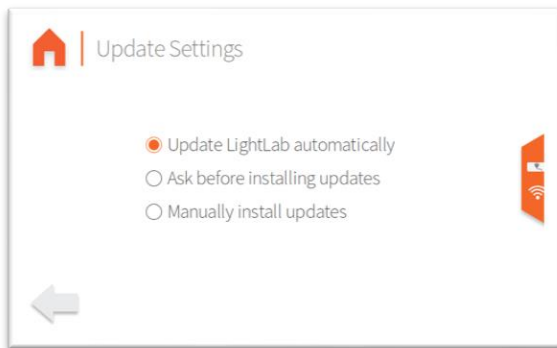
Enable Airplane Mode: Turns off all wireless communication, including mobile monitoring, result dashboard features as well as software update and support capabilities. We recommend keeping LightLab connected to the internet to ensure latest updates and support capabilities are available.

Volume Adjustment: Adjusts the system audio volume for indication of sample/zero completion.

Backlight Dim: Adjusts the amount of time before the screen dims to save battery life.

UPDATE

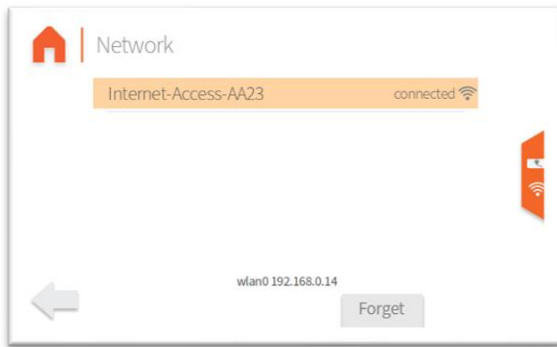
Adjusts LightLab updating behavior. Manual requires manually checking and installing updates. Ask before installing updates will indicate that an update is available on the side bar, but will not update without a manual selection, and automatically install updates will automatically keep LightLab up to date. Automatic updates will only occur if LightLab is connected to the internet. We highly recommend keeping LightLab connected to the internet and allowing automatic updates so that the latest performance and features will become available.



NETWORK

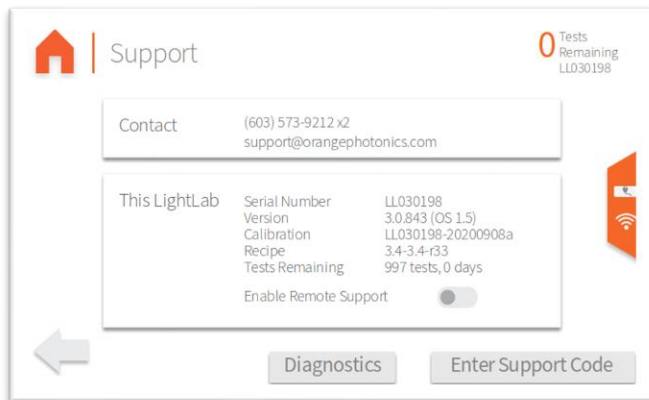
To access all the features on LightLab, an internet connection is required. This screen will allow you to set up and connect to an internet source. To join a network, select an in-range network and enter the password. Once connected, a connection will be saved and will automatically connect. If a connection is no longer desired, select the saved connection and press “Forget”. The IP address is shown at the bottom for troubleshooting. “No active connection” will be displayed if LightLab is not connected. Note it may take several minutes to connect a LightLab after powering the device on.

LIGHTLAB SETTINGS



SUPPORT

The support page will show information about your LightLab.



Contact information is displayed in case support questions are required. In addition, the following information is available:

- Serial number
- Software Version
- Calibration Version
- “Recipe” Version (Recipes contain information on how each sample type is run)
- Tests and time remaining until next calibration is due (1000 tests or 1 year is the recommended interval). LightLab will begin to remind you of an overdue calibration but will not stop functioning.
- Enable Remote Support: If this is turned on, it will allow a support technician at Orange Photonics to look at all the files/settings as well as physically run your LightLab remotely. This should only be turned on if requested by a support technician. Remote Support will automatically turn off after the instrument is powered off.

LIGHTLAB SETTINGS

- Diagnostics- limited diagnostic information is provided for troubleshooting if requested by a support technician.
- Enter a Support Code- allows entry of a code that can enable features or other functionality of your device. For example, if you purchase a module for your LightLab after the fact, a support code may be given to you to enter into the machine to activate the module.

DATA

Allows exporting data from your LightLab to an attached thumb drive.



Export User Data

Exports results saved on your device. One of 3 options are available:

- Export Last week
- Export last 20
- Export all

Exporting all data may take several minutes. When data is exported, a folder for each run is created that contains the following:

- A results.csv file that contains all the test information in a comma separated value (Excel compatible) format.
- A Certificate of Analysis (COA) that looks similar to a results screen.
- A chromatogram in .csv format that contains the raw data for future review (if enabled)

In addition, all runs will be exported to a results_all.csv file.

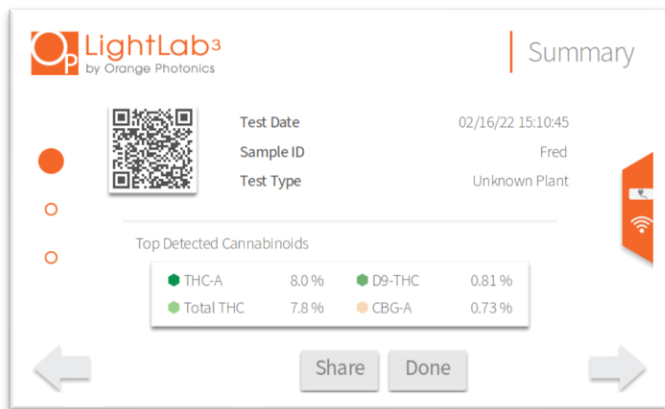
LIGHTLAB SETTINGS

Export Diagnostic Data

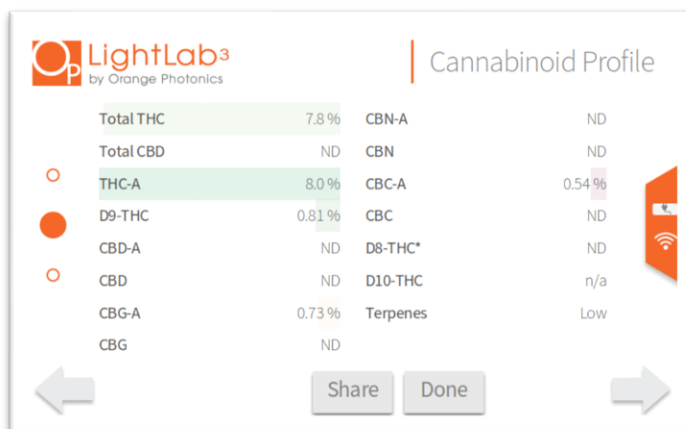
Exports a file that contains diagnostic data. This file cannot be opened by a user but may be requested by a support technician. In cases where your device is connected to the internet this is typically not required.

RESULTS

Allows a review of past results. You can scroll through different results with the arrows at the bottom left and right of the screen, or by swiping left and right.



The results screens are split into pages which can be accessed by swiping up and down, or by tapping the orange dots on the left side of the screen. The primary view is the Summary page, which displays test summary information such as test date, test type and an overview of which cannabinoids were detected in the sample.



The Cannabinoid Profile page shows all available cannabinoids and their detected concentrations.

LIGHTLAB SETTINGS



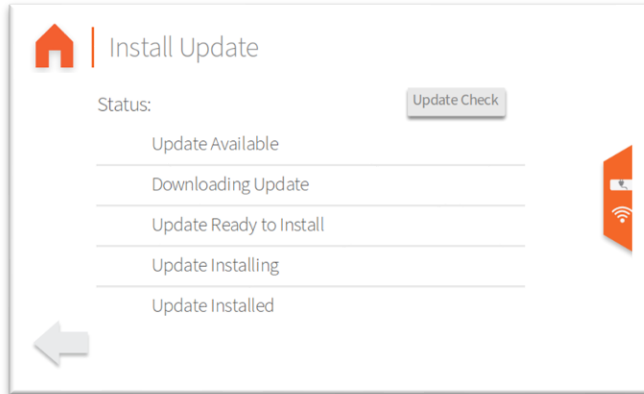
The Details page shows additional information about the test, including traceability data such as sample weight and moisture levels.

Results may be shared by pressing the Share button. The Share button allows entry of a mobile phone number or email address. The results will include sample information entered by the user as well as a screenshot of the results. Press Done to return to the home screen.

LIGHTLAB SETTINGS

UPDATES

If your LightLab is not set up for automatic updates, you can check for updates and update your device here. Press “Update Check” to check if updates are available. In most cases, your device needs to be connected to the internet before updates can be checked. In rare cases, a Support Technician may send you a file to put on your USB thumb drive, and the update check will find this file and run an update. Once an update is completed, a system reboot is required to finish the update.

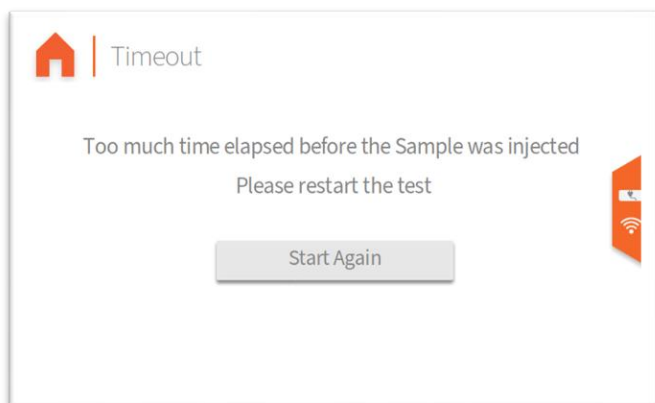


TROUBLESHOOTING

Troubleshooting

LightLab may display an error code that indicates a problem has occurred. Below each potential error code is described along with troubleshooting steps.

ZERO TIMEOUT



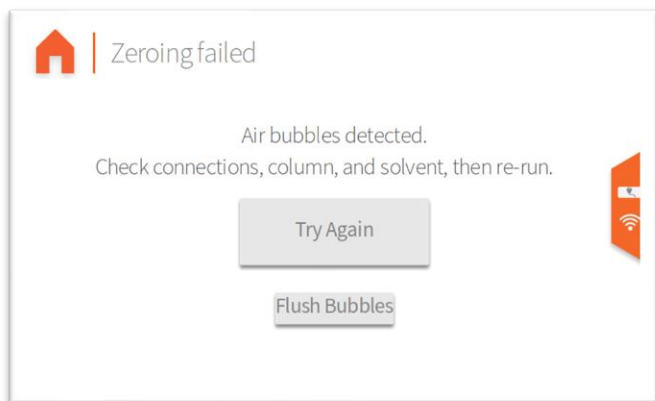
Description

To ensure an accurate analysis, a sample must be run within 4 minutes of completion of a zero. If LightLab is idle for longer than 4 minutes this error will appear.

Causes and Fixes

This is caused by waiting too long after zero has completed before starting a sample. Restart your test to continue.

AIR BUBBLES DETECTED



TROUBLESHOOTING

Description

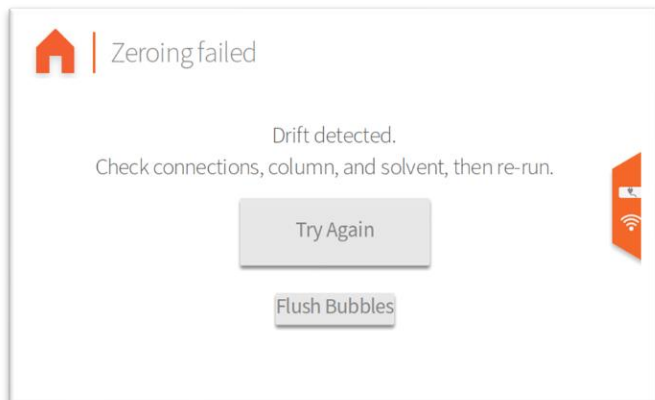
LightLab will check for air bubbles and attempt to purge any bubbles that are found, however in some cases a more in-depth bubble flush is required. LightLab will indicate when this occurs and will suggest a bubble flush routine.

Causes and Fixes

1. An air bubble has been trapped in the fluidics system. Press “Flush Bubbles” and follow the prompts to remove the air bubbles, or alternatively press “Try Again” to restart the test. Running “Flush Bubbles” is highly recommended as a first action since LightLab may not clear the bubbles without following this procedure, resulting in multiple bubble failures.
2. The solvent may have run out. Check the solvent level, and if it is empty replace the solvent and press “Flush Bubbles”.
3. The connections may be incorrect, loose, or damaged. Check to make sure all fluid connections are tight including the connections at the sample and waste bottles and the column connections. If a fluidics tubing is damaged, extra fluid tubing is included. To replace, pull out old tubing from the connectors, cut the new tubing to size and press firmly into the connector barbs.
4. Column was replaced without running “replace column” program. New columns need to be flushed with solvent before the first use. On rare occasions, even after sample flushing a bubble may occur. Run a “Replace Column” routine if this was the case and follow the prompts.
5. The instrument has a clog. Flush the sample input (Settings → Flush System → Clear Sample Input) and then re-start the analysis. If bubbles are still detected, flush the instrument forward (Settings → Flush System → Flush Forward). If bubbles are still detected, flush instrument backward (Settings → Flush System → Flush Backward). Contact Support if clog persists.

TROUBLESHOOTING

DRIFT DETECTED



Description

LightLab will check to ensure that the signal baseline is flat when no sample is present. If this is not the case, additional flushing will be used to flush the column. In some cases, other steps may be required to ensure a good baseline. The error indicates that the detector baseline is not stable. If this error appears, LightLab will suggest an appropriate flushing routine to fix the issue.

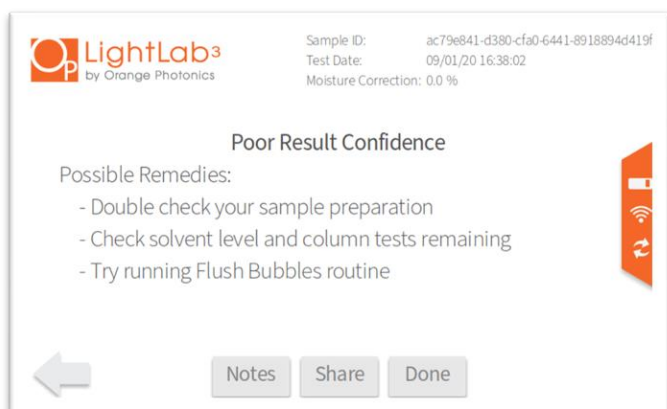
Causes and Fixes

1. An injection was made at the wrong time. If a sample was injected before a zero is started or if the last sample run was aborted after injection, there may be cannabinoids coming through the system. Press “Try Again” to restart- usually an incorrect injection simply needs more time to flush out of the system.
2. An air bubble has been trapped in the line. Press “Flush Bubbles” and follow the prompts to remove the air bubble, or alternatively press “Try Again” to restart the test. Running “Flush Bubbles” is highly recommended as a first action since LightLab may not clear the bubbles without following this procedure, resulting in multiple bubble failures.
3. The solvent may have run out. Check the solvent level, and if it is empty replace the solvent and press “Flush Bubbles”.
4. The temperature is changing rapidly. Make sure the system is located in a place where the temperature will not change quickly. Don’t leave LightLab in direct sunlight if possible.
5. The connections may be incorrect, loose, or damaged. Check to make sure all fluid connections are tight including the connections at the sample and waste bottles and the column connections. If a fluidics tubing is damaged, extra fluid

TROUBLESHOOTING

- tubing is included. To replace, pull out old tubing from the connectors, cut the new tubing to size and press firmly into the connector barbs.
6. Column was replaced without running “replace column” program. New columns need to be flushed with solvent before the first use. On rare occasions, even after sample flushing a bubble may occur. Run a “Replace Column” routine if this was the case and follow the prompts.
 7. The instrument has a clog. Flush the sample input (Settings → Flush System → Clear Sample Input) and then re-start the analysis. If bubbles are still detected, flush the instrument forward (Settings → Flush System → Flush Forward). If bubbles are still detected, flush instrument backward (Settings → Flush System → Flush Backward). Contact Support if clog persists.

POOR RESULT CONFIDENCE



Description

LightLab may indicate that the resulting confidence was poor and no results will display. LightLab analyzes the quality of the results calculated, and if the quality of the fit is not good, an error will be returned. LightLab will also analyze any failures and attempt to find a cause. If a cause is found, the error page will indicate the likely cause and suggest a remedy. If persistent failures are occurring, contact Orange Photonics Support.

Causes and Fixes:

1. Selective Separation Column is not installed. Install the column and re-run the test.
2. The sample preparation was incorrect causing an overrange or detector saturation condition. Double check your sample preparation and ensure it was

TROUBLESHOOTING

- completed properly. Check that the sample is run in the appropriate mode for the type of sample being analyzed.
3. The instrument may have been disturbed during sampling, causing an air bubble to obfuscate results. If this is the case, simply re-analyze the sample. The sample need not be re-extracted, there should be enough extracted sample to re-inject the same sample again.
 4. The solvent has run out. Replace the solvent by going to Settings → Replace Solvent, and then re-run the test.
 5. The warmup sequence was skipped or not completed correctly. Ensure solvent and column are in place, power off and on the instrument and repeat the warmup procedure.
 6. The analyzer is cold or hot. If possible, move the instrument to a warmer/cooler environment, then turn the device off and back on again, and ensure the warmup sequence is completed with solvent and fluid lines in place before running a sample.
 7. The Selective Separation Column is too old. If more than 25 tests have been run on the column, replace the column by going to Settings → Replace Column.
 8. The sample was not injected, or a bubble was introduced when injecting, or the valve was not set to RUN prior to starting analysis. Re-run sample and ensure that at least 3ml of sample is injected and the valve is set to run before beginning analysis. The sample need not be re-extracted, there should be enough extracted sample to re-inject the same sample again.
 9. Sample has unknown cannabinoid or contains other interfering components. In cases where persistent poor results occur especially for samples that contain significant amounts of other components (tinctures, oils, or edibles), the sample may have to be sent to a laboratory for analysis. In addition, this may be caused by plants that were sprayed with significant amounts of pesticides or other plant health products. Contact support if this occurs.
 10. The solvent has become degraded. If the solvent cap is left off for long periods (>5-10 minutes) or has become contaminated, the analysis may result in poor fits. Replace solvent by going to Settings → Replace Solvent.
 11. The instrument has a clog. Flush the sample input (Settings → Flush System → Clear Sample Input) and then re-start the analysis. For persistent clogs, flush the instrument forward (Settings → Flush System → Flush Forward), or backward (Settings → Flush System → Flush Backward). Contact Support if clog persists.

TROUBLESHOOTING

12. The flowmeter calibration has become faulty. In rare cases, the flowmeter calibration may become degraded causing poor results. If persistent poor results are occurring on multiple samples, contact support.

FLOW WAS TOO LOW/HIGH

Description

LightLab contains a highly sensitive flow meter that controls the flow and pressure inside the system to tight tolerances. If the flow is outside of a range and LightLab is unable to correct the condition, an error occurs.

Causes and Fixes:

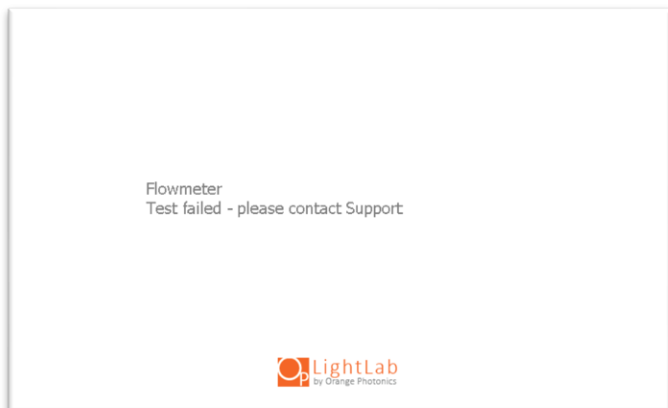
1. The solvent has become degraded. If the solvent cap is left off for long periods (>5 minutes) or has become contaminated, the analysis may result in poor fits. Replace solvent by going to Settings → Replace Solvent.
2. Incorrect solvent is being used. LightLab 3 requires LightLab 3 solvent. LightLab 2 solvent, pure methanol or other solvents will cause sample failures and could damage LightLab.
3. The solvent may have run out. Check the solvent level, and if it is empty press the “replace solvent” button to replace solvent, or access replace solvent from the settings menu.
4. The injection valve was set to “LOAD” during zero. The valve must always be set to “RUN” during zero sequence.
5. Selective Separation Column is not installed. Install the column and re-run the test.
6. The analyzer is too cold or hot, or the warmup sequence was skipped or not completed correctly. If possible, move the instrument to a conditioned environment, then turn the device off and back on again, and ensure the warmup sequence is completed with solvent and fluid lines in place before running a sample.
7. The connections may be incorrect, loose, or damaged. Check to make sure all fluid connections are tight including the connections at the sample and waste bottles and the column connections. If a fluidics tubing is damaged, extra fluid tubing is included. To replace, pull out old tubing from the connectors, cut the new tubing to size and press firmly into the connector barbs.
8. The instrument has a clog. Flush the sample input (Settings → Flush System → Clear Sample Input) and then re-start the analysis. For persistent clogs, flush the instrument forward (Settings → Flush System → Flush Forward), or backward

TROUBLESHOOTING

(Settings → Flush System → Flush Backward). Check whether solvent is moving through the tubing and into the waste bottle. Contact Support if clog persists.

9. The flowmeter calibration has become faulty. In rare cases, the flowmeter calibration may become degraded. If persistent flow errors are occurring on multiple samples, contact support.

POWER ON SELF TEST (POST) FAIL



Description

LightLab requires several critical components to operate. When the instrument starts up, critical components are tested during a Power On Self-Test (POST). If any component fails, the instrument will no longer be able to operate, and an error will display.

Causes and Fixes

1. The failed component may have simply not powered on correctly. Turn off the instrument, wait 10 seconds and power it back on.
2. The battery level may be too low to power on a critical component. Plug in charger and wait 10 minutes, then try again.
3. The incorrect charger may be plugged in. Replace with original charger and try again.
4. If a component continues to fail on startup, contact support.

TROUBLESHOOTING

MY RESULTS ARE LOWER/DIFFERENT THAN EXPECTED

Description

LightLab uses a similar technology to laboratory HPLC devices, and typically provides good correlation with laboratory results. There are several reasons that a result may be lower or different than expected described below.

Causes and Fixes

1. The sample preparation may be incorrect. If the weight and/or volume is incorrect, the LightLab result will not be accurate.
 - a. Double check the weight and volume added. If it is incorrect, re-extract the sample.
 - b. Check scale calibration and re-calibrate if necessary (see Section 11)
2. The extraction may not be complete. This occurs more often with concentrates than flower samples.
 - a. Heat is required for many concentrate samples. Skipping the heating step may result in lower than expected results. Flower can be extracted without heat.
 - b. After extraction of a concentrate sample, make sure there is no residue or unextracted parts of the sample to be analyzed. In some cases, the heating and extracting may have to be completed more than once to get a good extraction.
 - c. Make sure the sample is moved quickly from the heater to the shaker. If the sample is allowed to cool between heating and shaking, the extraction may not complete.
 - d. Make sure the sample is shaken for the entire shake time indicated. More shaking is ok but reducing the shake time may result in poor extraction and low results.
3. The incorrect solvent or bad solvent was used. Never use pure ethanol, grain alcohol, methanol, or any other solvents for extraction. When the sample is injected with incorrect solvent, the chromatography will suffer, resulting in incorrect results.
4. The sample may not have been injected into the analyzer completely.
 - a. Make sure at least 3ml of sample is injected prior to analysis. No air bubble should be injected.
 - b. If the samples become difficult to inject, clearing the sample input may be necessary, see Clearing Sample Input.

TROUBLESHOOTING

5. For flower, the moisture content of the plant may be significant. LightLab measures weight percent, and plant material will always contain some amount of moisture. If wet plants are being measured, they may need to be dried prior to analysis. There are several methods for drying plant material, contact support if more information is required. Moisture correction is possible with LightLab if turned on in settings.
6. If comparing against a laboratory test, there are several reasons the results may differ between LightLab and the laboratory.
 - a. The sample analyzed by LightLab may not be the same as that run by the lab. Cannabis is a natural product with variation between different flowers. We recommend a rigorous sampling method to get the most accurate view of a crop potency level:
 - i. Select a “sentinel” plant near the middle of your crop that is a good representation of your plants.
 - ii. Select a bud from the top, middle and bottom of this plant.
 - iii. Homogenize the bud with the included electric grinder and analyze each full bud. Bud weight should be at least 1 gram.
 - iv. Average the result from the three buds and use the average as your crop average.
 - b. If a sample is to be directly compared to a laboratory, we recommend the following procedure to avoid the variation in sample when comparing laboratory and LightLab results:
 - i. Select at least 1-2grams of sample and homogenize using the electric grinder.
 - ii. Collect the correct amount of sample for LightLab analysis and place it in a vial.
 - iii. Collect the required amount of sample for lab analysis and place in the same type of vial. This should be done at the same time so that no moisture content changes are likely.
 - c. The laboratory used may have higher than expected errors. Not all labs are created the same, and low-cost labs may not have rigorous standards for sample handling and analysis. We recommend using a reputable lab that analyzes potency using HPLC or similar chromatographic methods.
 - d. The random error of LightLab and laboratory results may be high enough to cause significant variation. For example, if both LightLab and a laboratory have an error of +/- 1%, a 15% sample may be 14% on

TROUBLESHOOTING

LightLab and 16% from a laboratory. The variation in results will contain both LightLab and laboratory errors.

- e. The sample may have degraded between tests. If the laboratory test was completed much earlier or later than LightLab analysis, the sample may have changed. Note acidic forms of cannabinoids (THCA and CBDA) will degrade into neutral forms (D9THC and CBD). The “Total D9THC” should remain similar unless significant degradation has occurred.
7. When benchmarking your results with industry results, keep in mind that often results shown at dispensaries are inflated. It is extremely rare for a plant to contain >30% cannabinoids (that would mean nearly 1/3 of the plant is cannabinoids- not leaving much for the plant structure, chlorophyll, etc.). Current regulations in several states have loopholes that allow labeled results to be higher than expected. Our experience has shown that high end cannabis can contain 15-25% THCA, and mid-grade contains 8-16% THCA.

LIGHTLAB REPORTS NO CANNABINOIDS PRESENT (ALL NDS)

Description

If LightLab does not detect a cannabinoid’s presence during analysis, it will report “ND”, which means “Not Detected”. In other words, when LightLab displays an ND for every cannabinoid, which means no cannabinoids were detected in your sample.

Causes and Fixes

1. Make sure the valve was set to LOAD when injecting a sample. If the valve was left on RUN, no sample would be injected into the instrument, and LightLab will report all NDs.
2. Make sure after injecting a sample that the valve is set to RUN. If the valve is left on LOAD after injection, LightLab will not analyze the injected sample, and will report all NDs.
3. The sample may not contain more cannabinoids than the detection limit. If your sample is plant material that contains less than 2% cannabinoids or a concentrate that contains less than 5% cannabinoids the sample preparation may need to be modified. Contact Orange Photonics Support for assistance with modifying the sample preparation.
4. The injection port may have clogged. If you cannot inject a sample, do not push harder and harder! Instead, follow the instructions in Settings->Flush System->Clear Sample Input. If clearing the sample input does not work, contact Orange Photonics Support.

TROUBLESHOOTING

5. The syringe filter may be clogged. If your sample contains large amounts of waxes, oils, or lipids, the syringe filter may get clogged. If this is the case, use a larger 25mm filter that is 45µm or larger pore size and PVDF or PTFE material. These are readily available on Amazon or any scientific supply store.
6. The sample preparation may be incorrect. If the weight was too small and/or volume is incorrect, LightLab may not see any cannabinoids above the detection limit.
7. The column may not be in place. Check to make sure the column is in place and has less than 25 runs completed through it.
8. Non-LightLab solvent may have been used for extraction or analysis. If this is the case, replace the solvent and run a flush forward by going to Settings->Flush System->Flush Forward. Using solvents other than those provided by Orange Photonics is not recommended and will void your warranty.

I CAN'T INJECT A SAMPLE INTO LIGHTLAB

Description

If you find it difficult or impossible to inject the full 3ml of sample into LightLab, stop! Do not continue to push harder on the sample input. The sample input may be jammed with material, which can be remedied in most cases, but becomes more difficult if the clog has been pushed very hard into place.

Causes and Fixes

1. The LightLab injector port is clogged. Go to Settings->Flush System->Clear Sample Input. See the Settings, Flush System section of this manual for more details. If after clearing the sample input is attempted you still cannot inject a sample, contact Orange Photonics Support for more assistance.
2. The syringe filter may be clogged. If your sample contains large amounts of waxes, oils, or lipids, the syringe filter may become clogged. If this is the case, use a larger 25mm filter that is 45µm or larger pore size and PVDF or PTFE material. These are readily available on Amazon or any scientific supply store.

I WANT TO RUN A SAMPLE OTHER THAN THOSE LISTED IN THIS MANUAL

LightLab is capable of running many types of samples that contain cannabinoids, however due to the variation seen in many samples we can't easily provide specific sample preparation recommendations for all samples. We do have further resources available on our website, including sample preparation guides for many types of samples not listed here. We are always happy to help come up with a sample

TROUBLESHOOTING

preparation technique for your particular sample. Contact Orange Photonics Support if you would like assistance with a particular sample type.

COMPLIANCE AND SAFETY INFORMATION

Compliance and Safety Information

SAFETY INFORMATION

The use of LightLab involves solvents and laboratory equipment. Proper understanding of the system and operation is critical to safety. The LightLab solution contains methanol and should be handled with caution. The Safety Data Sheet (SDS) for LightLab solution can be found here:

OrangePhotonics.com/s/SDS.pdf

The following safety considerations should be followed to ensure safe operation of LightLab:

- Please read and understand this manual before using LightLab.
- Wear latex or similar gloves and eye protection when using the device.
- Never operate the device near or in the same room as open flames.
- Use care when handling LightLab solvent, it contains methanol and is flammable.
- Use LightLab in a well-ventilated area.
- Dispose of any methanol waste per your local laws.
- Never use a LightLab that is damaged or operating erratically. Never use the device for anything but its intended use.
- Do not open LightLab, harmful UV rays may be present inside the device.

COMPLIANCE INFORMATION

LightLab contains components with the following FCC and IC registrations:

FCC ID: 2ABCB-RPI4B

IC ID: 20953-RPI4B

LightLab bears the CE mark and is in conformity with the provisions of:

- Council Directive 2014/30/EU on Electromagnetic Compatibility
 - EN 61326-1:2013
- Council Directive 2014/35/EU on Low Voltage Equipment Safety
 - EN 62368-1:2014/AC:2015
- Council Directive 2014/53/EU on Radio Equipment
 - EN 301489-1
 - EN 301489-17 (in conjunction with EN 55032 and EN 55024 as Class B equipment)
 - EN 300328 v2.1.1

COMPLIANCE AND SAFETY INFORMATION

- EN 301893 v2.1.1
- Council Directive 2015/863/EU on Restriction of Hazardous Substances in Electrical and Electronic Equipment

LightLab is compliant with Thailand technical standard conformity as follows:

เครื่องวิทยุคมนาคมนี้มีระดับการแผ่คลื่นแม่เหล็กไฟฟ้าสอดคล้องตามมาตรฐาน

ความปลอดภัยต่อสุขภาพของมนุษย์จากการใช้เครื่องวิทยุคมนาคมที่คณะกรรมการกิจการโทรคมนาคมแห่งชาติประกาศกำหนด

(This radiocommunication equipment has the electromagnetic field strength in compliance with the Safety Standard for the Use of Radiocommunication Equipment on Human Health announced by the National Telecommunications Commission.)

TECHNICAL SPECIFICATIONS

| | |
|----------------------|---|
| Dimensions | 18.5 x 6.9 x 14.1 inches |
| Weight | 11 pounds |
| Power Requirements | 16V, 1.8A (120-240 AC Adapter included) |
| Battery life | 8 hours, rechargeable |
| Battery Type | Lithium Ion, 14.8V 4400mAh |
| Interface | 7" touch screen |
| Access | Wi-Fi and Bluetooth enabled |
| Data | CSV (excel compatible), email, text |
| Measurement time | 8.5 minutes (2 minute zero) |
| Sample preparation | Simple solvent extraction |
| Sample size | 100-500 mg typical |
| Warranty | 1-year, extended options available |
| Calibration Services | 1,000 tests or 1-year, at Orange Photonics |
| Technology | High Performance Liquid Chromatography (HPLC), Spectroscopy |

CONTACT INFORMATION

Contact Information

SUPPORT CONTACT INFORMATION

+1 603.573.9212 x2

support@OrangePhotonics.com

Support Hours:

Monday – Friday

8AM – 6PM Eastern (5AM-3PM Pacific)

NOTE: we make every effort to respond to any support inquiry within 24 hours.

CONSUMABLES AND ACCESSORIES

Consumables and accessories can be purchased online or by contacting Orange Photonics sales. The store may be accessed here:

<https://www.orange Photonics.com/store/>

GENERAL INQUIRIES

+1 603.573.9212 x0

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SALES SUPPORT

+1 603.573.9212 x1

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APPENDIX 1: DRYING RECOMMENDATIONS

Appendix 1: Plant Sample Drying Recommendations

To get the most accurate cannabinoid information using LightLab, we recommend drying samples before analysis. Wet plant samples may contain 70+% water content, so this can have a significant effect on the resulting weight percent cannabinoid content. Removing any moisture will reduce sample result variation and improve overall accuracy of measurement. Note drying samples is required in “Hemp Compliance” mode for THC analysis of Hemp.

There are several methods which can be employed depending on the equipment available and time available for drying the sample. Note that rapidly heating samples can result in some decarboxylation (conversion of THCA to D9THC and CBDA to CBD), however the “total D9THC” and “total CBD” numbers will not change with the methods listed below.

OPTION 1: USE A GRAVIMETRIC MOISTURE ANALYZER

This is the preferred method if the equipment is available. A gravimetric moisture meter will heat a sample to dry it out and will calculate the moisture content based on loss of weight. Drying and moisture content results can be obtained in just a few minutes. We recommend an Ohaus MB23 moisture analyzer, though there are others that will likely work equally well. This method not only dries a sample for analysis with LightLab, but also provides moisture level information.

1. Measure the moisture content per the moisture analyzer’s instructions. At least 3g of starting material is recommended so that the moisture measurement is accurate and ensure that there is enough material after the test to use for LightLab analysis.
2. Once the moisture analysis is complete, there should be leftover material in the moisture analyzer container that is fully dry. Use this as the starting material for a LightLab analysis. Note it is also possible to measure wet samples from the same batch by using LightLab’s moisture correction entry to enter the moisture content measured on the moisture analyzer prior to analysis.

OPTION 2: USE A FOOD DEHYDRATOR

This method works well but can take several hours (depending on your food dehydrator). If time allows, this method works well, is repeatable, and results in the least amount of decarboxylation. In addition, multiple samples can be dried at a time.

1. Place at least 5g of your plant samples into the dehydrator and turn it on.

APPENDIX 1: DRYING RECOMMENDATIONS

2. Run the dehydrator 4-12 hours until the sample is completely dry. When it is completely dry, the leaves will crumble when touched and any buds will be brittle.
3. Once the sample is completely dehydrated, proceed to LightLab analysis.

OPTION 3: USE A MICROWAVE

This is the fastest method, though it requires careful control over the microwave. If a sample is left unattended in the microwave for too long, it can burn which will make the sample unusable for LightLab analysis.

1. Place at least 3g of plant material onto a plate and place in the microwave.
2. Run the microwave for 10-15 seconds.
3. Stir/move around the sample and place back in microwave. If a sample burns, discard and try again.
4. Repeat steps 3 and 4 multiple times until the sample is completely dry. When it is completely dry, the leaves will crumble when touched and any buds will be brittle. This typically takes 1-3 minutes.
5. Once the sample is dried, proceed to LightLab analysis.

APPENDIX 2: Δ8THC ANALYSIS INFORMATION

Appendix 2: Δ8THC Analysis Information

During our research, testing and validation of Δ8THC (Delta-8-Tetrahydrocannabinol) for LightLab 3, we found two interesting results:

1. Every Δ8THC sample we analyzed contained significant Δ9THC (typically more than 2%). The only exception to this was actual certified reference materials, which contained no Δ9THC.
2. If the same sample is sent to multiple laboratories, the amount of Δ9THC and Δ8THC reported varied significantly. For example, one sample sent to 9 laboratories varied from 0% to over 7.5% Δ9THC.

These two results are related to the process in which Δ8THC is typically made. Generally, Δ8THC is synthesized from CBD by using heat and a catalyst. The process is not perfectly specific, meaning it can make many different cannabinoids alongside Δ8THC, including Δ9THC. Most of these cannabinoids are not fully understood except for Δ9THC. Since there are so many unknown cannabinoids present, measuring the amount of Δ8THC and Δ9THC in Δ8THC concentrates can be challenging. To make matters worse, Δ9THC and Δ8THC are themselves similar in molecular structure. That means for both laboratories and LightLabs alike, it is a challenge to accurately quantify the two cannabinoids in a Δ8THC concentrate.

Due to these challenges, when a Δ8THC sample is analyzed by a laboratory or a LightLab, there are two things to be aware of:

1. The level of accuracy for both Δ8THC and Δ9THC will be lower than the other reported cannabinoids.
2. The sample will likely contain significant levels of Δ9THC. In other words, the samples are likely to be “hot” or adult-use only.

Orange Photonics has developed a specific analysis for Δ8THC that allows LightLab to achieve higher accuracy than by using a more generalized HPLC measurement approach. With that said, the following limitations of our algorithm should be noted:

1. Δ8THC has a detection limit of 12% in concentrate samples, and 4% in flower samples.
2. Δ8THC and Δ9THC values can be affected by other cannabinoids that are made in the Δ8THC synthesis process and may have errors in the 2-5% range.

Δ8THC contains an asterisk next to the cannabinoid name as a reminder to use caution when interpreting results that contain Δ8THC.

APPENDIX 3: LIGHTLAB PERFORMANCE SPECS

LightLab 3 Detection Limits and Performance Specifications

LightLab performance is described using 3 different methods listed below. Detection limits for a particular sample are listed in the LightLab Certificate of Analysis for all analytes measured.

Detection Limit: The minimum concentration of a particular analyte (cannabinoid or tryptamine) that LightLab can detect and quantify.

Repeatability: The expected variation in results from run-to-run on a single LightLab.

Reproducibility: The expected variation in results between multiple LightLabs running the same sample.

LIGHTLAB 3 CANNA SPECIFICATIONS

| Sample Type | Typical Concentration, % | Detection Limit % | ± Absolute Repeatability | ± Absolute Reproducibility | RSD repeatability | RSD Reproducibility |
|-----------------|--------------------------|-------------------|--------------------------|----------------------------|-------------------|---------------------|
| THC Plant | 20% | 0.5% | 0.7% | 0.9% | 1.8% | 2.3% |
| CBD Plant | 15% | 0.8% | 0.9% | 1.1% | 3.0% | 3.6% |
| Unknown Plant | 20% | 0.5% | 0.7% | 0.9% | 1.8% | 2.3% |
| THC Concentrate | 80% | 1.5% | 2.1% | 2.8% | 1.3% | 1.8% |
| CBD Concentrate | 80% | 2.1% | 3.1% | 3.9% | 1.9% | 2.5% |
| Unknown Conc. | 80% | 1.5% | 2.1% | 2.8% | 1.3% | 1.8% |
| Hemp Compliance | 0.25% | 0.10% | 0.0% | 0.0% | 6.5% | 7.6% |
| Young Plant | 3% | 0.10% | 0.1% | 0.2% | 2.3% | 2.9% |
| Raffinate | 10% | 0.25% | 0.4% | 0.5% | 1.8% | 2.3% |
| Tincture | 3% | 0.17% | 0.2% | 0.2% | 3.2% | 3.8% |
| Isolate | 95% | 3.0% | 4.2% | 5.3% | 2.2% | 2.8% |

APPENDIX 3: LIGHTLAB PERFORMANCE SPECS

LIGHTLAB 3 HS PERFORMANCE SPECIFICATIONS

| Sample Type | Typical Dose, mg | Serving size, g or ml | Typical Concentration, % | Detection Limit % | Dosage Detection Limit, mg | ± Absolute Repeatability | ± Absolute Reproducibility | ± Dosage Repeatability, mg | ± Dosage Reproducibility, mg | RSD repeatability | RSD Reproducibility |
|--------------------------|------------------|-----------------------|--------------------------|-------------------|----------------------------|--------------------------|----------------------------|----------------------------|------------------------------|-------------------|---------------------|
| THC Plant | - | - | 20% | 0.5% | - | 0.7% | 0.9% | - | - | 1.8% | 2.3% |
| CBD Plant | - | - | 15% | 0.8% | - | 0.9% | 1.1% | - | - | 3.0% | 3.6% |
| Unknown Plant | - | - | 20% | 0.5% | - | 0.7% | 0.9% | - | - | 1.8% | 2.3% |
| THC Concentrate | - | - | 80% | 1.5% | - | 2.1% | 2.8% | - | - | 1.3% | 1.8% |
| CBD Concentrate | - | - | 80% | 2.1% | - | 3.1% | 3.9% | - | - | 1.9% | 2.5% |
| Unknown Conc. | - | - | 80% | 1.5% | - | 2.1% | 2.8% | - | - | 1.3% | 1.8% |
| Hemp Compliance | - | - | 0.25% | 0.10% | - | 0.0% | 0.0% | - | - | 6.5% | 7.6% |
| Young Plant | - | - | 3% | 0.10% | - | 0.1% | 0.2% | - | - | 2.3% | 2.9% |
| Raffinate | - | - | 10% | 0.25% | - | 0.4% | 0.5% | - | - | 1.8% | 2.3% |
| Tincture | - | - | 3% | 0.17% | - | 0.2% | 0.2% | - | - | 3.2% | 3.8% |
| Isolate | - | - | 95% | 3.0% | - | 4.2% | 5.3% | - | - | 2.2% | 2.8% |
| Gummy | 10 | 3.5 | 0.29% | 0.0067% | 0.2 | 0.010% | 0.013% | 0.3 | 0.4 | 1.7% | 2.2% |
| Beverage | 10 | 355 | 0.00% | 0.00017% | 0.6 | 0.00018% | 0.00022% | 0.7 | 0.8 | 3.3% | 4.0% |
| Beverage Enhancer Liquid | 100 | 30 | 0.33% | 0.0067% | 2.0 | 0.0095% | 0.013% | 2.8 | 3.8 | 1.4% | 1.9% |
| Beverage Enhancer Powder | 10 | 2.5 | 0.40% | 0.0067% | 0.2 | 0.0089% | 0.0124% | 0.2 | 0.3 | 1.1% | 1.6% |
| Chocolate | 10 | 10 | 0.10% | 0.0033% | 0.3 | 0.0046% | 0.0057% | 0.5 | 0.6 | 2.3% | 2.9% |
| Baked Goods | 10 | 25 | 0.04% | 0.0017% | 0.4 | 0.0021% | 0.0026% | 0.5 | 0.7 | 2.7% | 3.3% |
| Hard Candy | 5 | 10 | 0.05% | 0.0033% | 0.3 | 0.0035% | 0.0042% | 0.3 | 0.4 | 3.5% | 4.2% |
| Mint/Tablet | 5 | 2 | 0.25% | 0.0067% | 0.1 | 0.0096% | 0.0122% | 0.2 | 0.2 | 1.9% | 2.4% |
| Caramel/Taffy | 5 | 10 | 0.05% | 0.0033% | 0.3 | 0.0035% | 0.0042% | 0.3 | 0.4 | 3.5% | 4.2% |
| Nanoemulsion Liquid | 25 | 1 | 2.50% | 0.2000% | 2.0 | 0.19% | 0.23% | 1.9 | 2.3 | 3.8% | 4.5% |
| Nanoemulsion Solid | 25 | 1 | 2.50% | 0.2000% | 2.0 | 0.19% | 0.23% | 1.9 | 2.3 | 3.8% | 4.5% |

LIGHTLAB 3 PSY+CANNA PERFORMANCE SPECIFICATIONS

Cannabis Performance Specifications

| Sample Type | Typical Dose, mg | Serving size, g or ml | Typical Concentration, % | Detection Limit % | Dosage Detection Limit, mg | ± Absolute Repeatability | ± Absolute Reproducibility | ± Dosage Repeatability, mg | ± Dosage Reproducibility, mg | RSD repeatability | RSD Reproducibility |
|--------------------------|------------------|-----------------------|--------------------------|-------------------|----------------------------|--------------------------|----------------------------|----------------------------|------------------------------|-------------------|---------------------|
| THC Plant | - | - | 20% | 0.5% | - | 0.7% | 0.9% | - | - | 1.8% | 2.3% |
| CBD Plant | - | - | 15% | 0.8% | - | 0.9% | 1.1% | - | - | 3.0% | 3.6% |
| Unknown Plant | - | - | 20% | 0.5% | - | 0.7% | 0.9% | - | - | 1.8% | 2.3% |
| THC Concentrate | - | - | 80% | 1.5% | - | 2.1% | 2.8% | - | - | 1.3% | 1.8% |
| CBD Concentrate | - | - | 80% | 2.1% | - | 3.1% | 3.9% | - | - | 1.9% | 2.5% |
| Unknown Conc. | - | - | 80% | 1.5% | - | 2.1% | 2.8% | - | - | 1.3% | 1.8% |
| Hemp Compliance | - | - | 0.25% | 0.10% | - | 0.0% | 0.0% | - | - | 6.5% | 7.6% |
| Young Plant | - | - | 3% | 0.10% | - | 0.1% | 0.2% | - | - | 2.3% | 2.9% |
| Raffinate | - | - | 10% | 0.25% | - | 0.4% | 0.5% | - | - | 1.8% | 2.3% |
| Tincture | - | - | 3% | 0.17% | - | 0.2% | 0.2% | - | - | 3.2% | 3.8% |
| Isolate | - | - | 95% | 3.0% | - | 4.2% | 5.3% | - | - | 2.2% | 2.8% |
| Gummy | 10 | 3.5 | 0.29% | 0.0200% | 0.7 | 0.020% | 0.024% | 0.7 | 0.9 | 3.6% | 4.3% |
| Beverage | 10 | 355 | 0.00% | 0.00050% | 1.8 | 0.00029% | 0.00034% | 1.0 | 1.2 | 5.1% | 6.0% |
| Beverage Enhancer Liquid | 100 | 30 | 0.33% | 0.0200% | 6.0 | 0.0219% | 0.027% | 6.6 | 8.0 | 3.3% | 4.0% |
| Beverage Enhancer Powder | 10 | 2.5 | 0.40% | 0.0200% | 0.5 | 0.0238% | 0.0291% | 0.6 | 0.7 | 3.0% | 3.6% |
| Chocolate | 10 | 10 | 0.10% | 0.0100% | 1.0 | 0.0083% | 0.0099% | 0.8 | 1.0 | 4.2% | 5.0% |
| Baked Goods | 10 | 25 | 0.04% | 0.0050% | 1.3 | 0.0036% | 0.0043% | 0.9 | 1.1 | 4.5% | 5.4% |
| Hard Candy | 5 | 10 | 0.05% | 0.0100% | 1.0 | 0.0053% | 0.0063% | 0.5 | 0.6 | 5.3% | 6.3% |
| Mint/Tablet | 5 | 2 | 0.25% | 0.0200% | 0.4 | 0.0189% | 0.0227% | 0.4 | 0.5 | 3.8% | 4.5% |
| Caramel/Taffy | 5 | 10 | 0.05% | 0.0100% | 1.0 | 0.0053% | 0.0063% | 0.5 | 0.6 | 5.3% | 6.3% |
| Nanoemulsion Liquid | 25 | 1 | 2.50% | 0.2000% | 2.0 | 0.19% | 0.23% | 1.9 | 2.3 | 3.8% | 4.5% |
| Nanoemulsion Solid | 25 | 1 | 2.50% | 0.2000% | 2.0 | 0.19% | 0.23% | 1.9 | 2.3 | 3.8% | 4.5% |

APPENDIX 3: LIGHTLAB PERFORMANCE SPECS

Psychedelics Performance Specifications

| Sample Type | Typical Dose, mg | Serving size, g or ml | Typical Concentration, % | Detection Limit % | Dosage Detection Limit, mg | ± Absolute Repeatability | ± Absolute Reproducibility | ± Dosage Repeatability, mg | ± Dosage Reproducibility, mg | RSD repeatability | RSD Reproducibility |
|---------------------|------------------|-----------------------|--------------------------|-------------------|----------------------------|--------------------------|----------------------------|----------------------------|------------------------------|-------------------|---------------------|
| Biomass | - | - | 1% | 0.08% | - | 0.07% | 0.09% | - | - | 3.7% | 4.4% |
| Concentrate 0-15% | - | - | 5% | 0.8% | - | 0.5% | 0.6% | - | - | 4.8% | 5.7% |
| Concentrate 15-100% | - | - | 50% | 3.3% | - | 3.5% | 4.2% | - | - | 3.5% | 4.2% |
| Gummy | 5 | 3.5 | 0.14% | 0.0100% | 0.4 | 0.010% | 0.012% | 0.4 | 0.4 | 3.6% | 4.3% |
| Chocolate | 5 | 10 | 0.05% | 0.00500% | 0.5 | 0.004% | 0.005% | 0.4 | 0.5 | 4.2% | 5.0% |
| Capsule | 5 | 0.5 | 1.00% | 0.0750% | 0.4 | 0.073% | 0.088% | 0.4 | 0.4 | 3.7% | 4.4% |
| Wet Biomass | 10 | 2.5 | 0.40% | 0.0200% | 0.5 | 0.024% | 0.029% | 0.6 | 0.7 | 3.0% | 3.6% |

LIGHTLAB PSY PERFORMANCE SPECIFICATIONS

| Sample Type | Typical Dose, mg | Serving size, g or ml | Typical Concentration, % | Detection Limit % | Dosage Detection Limit, mg | ± Absolute Repeatability | ± Absolute Reproducibility | ± Dosage Repeatability, mg | ± Dosage Reproducibility, mg | RSD repeatability | RSD Reproducibility |
|---------------------|------------------|-----------------------|--------------------------|-------------------|----------------------------|--------------------------|----------------------------|----------------------------|------------------------------|-------------------|---------------------|
| Biomass | - | - | 1% | 0.08% | - | 0.07% | 0.09% | - | - | 3.7% | 4.4% |
| Concentrate 0-15% | - | - | 5% | 0.8% | - | 0.5% | 0.6% | - | - | 4.8% | 5.7% |
| Concentrate 15-100% | - | - | 50% | 3.3% | - | 3.5% | 4.2% | - | - | 3.5% | 4.2% |
| Gummy | 5 | 3.5 | 0.14% | 0.0100% | 0.4 | 0.010% | 0.012% | 0.4 | 0.4 | 3.6% | 4.3% |
| Chocolate | 5 | 10 | 0.05% | 0.00500% | 0.5 | 0.004% | 0.005% | 0.4 | 0.5 | 4.2% | 5.0% |
| Capsule | 5 | 0.5 | 1.00% | 0.0750% | 0.4 | 0.073% | 0.088% | 0.4 | 0.4 | 3.7% | 4.4% |
| Wet Biomass | 10 | 2.5 | 0.40% | 0.0200% | 0.5 | 0.024% | 0.029% | 0.6 | 0.7 | 3.0% | 3.6% |